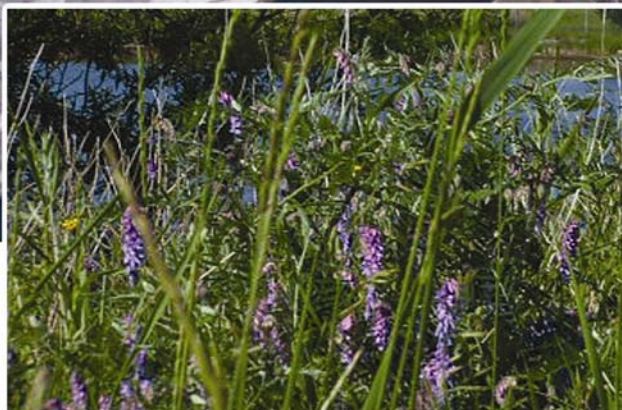


Joint Review Panel Environmental Assessment Report



Sydney Tar Ponds and Coke Oven Sites Remediation Project

Joint Review Panel

Sydney Tar Ponds and Coke Ovens Sites
Remediation Project
www.stpco-review.ca

July 12, 2006

The Honourable Rona Ambrose
Minister of the Environment
East Block, Room 163
Ottawa ON K1A 0A6

The Honourable Mark Parent
Minister of Environment and Labour
5151 Terminal Road
Halifax NS B3J 2T8

Dear Ministers:

In accordance with the mandate issued on July 14, 2005, the Joint Review Panel has completed its assessment of the Sydney Tar Ponds and Coke Ovens Sites Remediation Project as proposed by the Sydney Tar Ponds Agency.

We are pleased to submit our report for your consideration.

Respectfully,

Original signed by
Lesley Griffiths (Chairperson)

Original signed by
William H.R. Charles

Original signed by
Louis LaPierre

Joint Review Panel Environmental Assessment Report



Sydney Tar Ponds and Coke Oven Sites Remediation Project

July 2006

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EXECUTIVE SUMMARY

THE PROJECT

The Sydney Tar Ponds Agency (STPA) proposes to remediate contamination at the site of the old Coke Ovens and in the adjacent Muggah Creek estuary, also known as the Tar Ponds. The contamination was caused over many decades by releases of PAHs, PCBs and heavy metals from the steelmaking industry in Sydney, now defunct. The intent of the Project is both to reduce risks to people and the environment, and to create social and economic benefits. STPA has already begun a program of preventative works, including construction of a barrier at the mouth of Muggah Creek at Battery Point and diversion of streams currently flowing through the contaminated sites. STPA is proposing to remediate the two sites using a combination of removal and destruction technologies and containment systems.

At the Coke Ovens site, containment structures around the perimeter would prevent groundwater from entering the site. Material from the Tar Cell and sediments from Coke Ovens Brook would be excavated and sent by rail to a temporary incinerator. Approximately 40% of the site, where contaminants in the soils exceed certain levels, would be capped to limit the infiltration of surface water and to prevent people or wildlife from coming into contact with the contaminants. In some areas, STPA would carry out a form of bioremediation called landfarming before capping, in order to treat some of the hydrocarbons in the soil. Non-hazardous waste debris generated during the remediation at both sites may be landfilled in an uncapped portion of the site. Remediation of the Coke Ovens site would be complete by 2011.

At the Tar Ponds, two areas of sediments with PCBs in higher concentrations (over 50 part per million) would be excavated, conditioned and transported by rail for

incineration. The remaining sediments in the Tar Ponds would be solidified in-place using cement and other materials, and capped. STPA would construct an internal drainage system in order to manage the influx of both groundwater and seawater. Remediation of the Tar Ponds would be complete by 2014.

During the construction phase wastewater generated by activities at both sites will be treated before discharge to one or more water treatment facilities. STPA would continue to pump and treat groundwater after construction has been completed for as long as monitoring results showed it to be necessary.

A temporary incinerator would be constructed at either the Victoria Junction or Phalen sites in order to incinerate approximately 150,000 tonnes of contaminated sediments and soils. The incinerator would operate for three years; construction and then decommissioning would take another two years. STPA has also proposed an alternative means of carrying out the Project that would eliminate the use of incineration, and would solidify / stabilize all of the Tar Ponds sediments in-place. The Tar Cell material and Coke Ovens Brook sediments would be similarly treated together at the Tar Cell.

STPA expects to generate between 380 and 435 years of fulltime employment during the construction phase, and predicts that 65-75% of labour and supplies will be sourced within Nova Scotia.

THE REVIEW PROCESS

An independent Joint Review Panel was appointed on September 19, 2005 to conduct an environmental assessment of the proposed Project. The members of the Panel are Ms. Lesley Griffiths (Chair), Mr. William H.R.

Charles, and Dr. Louis LaPierre. This report details the Panel’s findings.

In conducting its review of the Project, the Panel was guided by the terms of a Joint Panel Agreement signed on July 14, 2005 by the Minister of the Environment for Canada and the Nova Scotia Minister of Environment and Labour. The Panel held 17 days of public hearings in Sydney, Nova Scotia in April and May, 2006.

THE PANEL’S OVERALL CONCLUSION

The Panel’s mandate was to determine whether the Project presented by STPA or any alternative means of carrying out the Project that are technically and economically feasible, would result in significant adverse environmental effects. In the process of reaching its overall conclusion, the Panel made four key findings:

- STPA described the Project as *permanent remediation* that would at some undefined time in the future require no further monitoring or maintenance – in other words a “walk away” solution. The Panel believes this may be true for the Coke Ovens, but not for the Tar Ponds. Therefore STPA, the regulators and the public must be prepared for the possibility that the Tar Ponds site will have to be managed in perpetuity;
- Both the community and STPA have placed great importance on the use of *proven technologies*. The Panel is not convinced that the solidification / stabilization technology is proven for use in the Tar Ponds context — that is, to be applied to organic contaminants in organically enriched sediments in an estuary with potential groundwater and seawater influx. The Panel understands that the primary remediation technology to be applied to the Tar Ponds is containment, with use of solidification / stabilization as a secondary

approach. Nevertheless, the Panel believes that further pilot studies must be carried out and specific targets reached before this technology is approved for use in the Project;

- The Panel has concluded that, with appropriate technology selection and stringent regulation, *incineration* could be carried out without significant adverse environmental effects. However, the Panel heard and takes seriously the widespread community concerns about the use of incineration and agrees that a measure of stress and anxiety would likely result. The Panel believes that, under the terms of the *Toxic Substances Management Policy*, the federal government is obliged to weigh the relative merits of choosing to remove and destroy PCBs versus managing them in-place. The Panel was told that requirements of this risk benefit assessment have only been partly met, and concludes that the results of a complete assessment, including a comparison of risks and benefits to both human health and the environment, may indicate that the “full containment, no incineration” alternative put forward by STPA would be a better approach than employing incineration; and
- The Panel understands that the *future uses* of the two sites is not part of the Project but has concluded that ensuring that the sites have the capacity to support viable and sustainable uses must be an integral part of the Project design.

The Panel has concluded that the Project and the technically and economically feasible means of carrying out the Project are unlikely to result in significant adverse environmental effects provided the recommendations specified in this report are followed and implemented and subject to the results of the risk benefit assessment carried out under the terms of federal policy. As a result, the Panel has the following recommendations:

Recommendation # 1

Recommendation to NSEL

The Panel recommends that the Nova Scotia Minister of Environment and Labour approve the undertaking subject to conditions which address the recommendations in this report.

Recommendation # 2

STPA Mitigation Measures

The Panel recommends that the Government of Canada and the Government of Nova Scotia ensure that mitigation measures proposed by the Sydney Tar Ponds Agency as an integral part of the Project are implemented.

ALTERNATIVES

The Panel was satisfied that STPA had evaluated alternatives to the Project, and also reviewed a number of alternative means of carrying out the Project. The Panel agreed with STPA's revised contention that the "full containment, no incineration" option should be considered to be a technically and economically feasible alternative means of carrying out the Project. The Panel heard presentations regarding remediation approaches involving soil washing and co-burning, but on the basis of the information provided, concluded that these were not feasible.

REMEDICATION OF THE TAR PONDS AND COKE OVENS SITES

The Panel heard that there are concerns about the management and monitoring of air quality impacts that may result from excavation, landfarming and solidification and stabilization activities. These concerns were closely tied to past experiences with earlier cleanup related

work and with perceptions around health risks. Presenters talked of a need for real time monitoring with public access to results, and more extensive use of enclosures over work areas. The Panel's recommendations address further work on estimating total air emissions, examination of the potential air quality impacts of the solidification and stabilization process in a pilot study, and the requirement for a detailed monitoring and follow-up program.

The Project involves extensive interception of groundwater to reduce future contact between both ground and surface water with remaining contaminated soils and sediments. The Panel agrees that this component of the Project will have a beneficial effect on environmental quality, and has recommended the use of more extensive hydrographic modeling to refine Project design and avoid any adverse impacts from redirection of groundwater flows, and a comprehensive groundwater monitoring program.

Both the Tar Ponds site and extensive areas of the Coke Ovens site will be capped. The Panel heard questions and criticisms about the design, function, durability and monitoring of the caps, and has made recommendations to address these issues.

The Panel reviewed extensive information regarding the advantages and disadvantages of using solidification / stabilization technology, which has been used quite extensively in other areas to address contaminated sites. Much of the discussion centred on whether the technology could be considered proven for the Tar Ponds context (largely organic contaminants in organically enriched sediments, in an estuarine location), how the proposed internal drainage system would work, what performance criteria were appropriate and how they should be tested. Concerns were also raised about the reported results of STPA bench scale tests of the

technology on both Tar Ponds and Tar Cell materials. The Panel recognized that containment rather than solidification / stabilization is the primary remediation approach, but concluded that if the technology is to be used it needs to be further evaluated through a pilot study based on specific performance criteria ensuring that solidification / stabilization would not significantly increase contaminant mobility.

The Panel has also recommended that the need to undertake landfarming activities at the Coke Ovens site be re-evaluated. This recommendation stems from STPA's own information regarding the uncertainty of success and potential effects on some bird populations, and from public concerns about air quality effects.

Fisheries and Oceans Canada (DFO) told the Panel that environmental quality in Sydney Harbour is gradually improving and that removal and containment of the contamination at the Tar Ponds and Coke Ovens site will continue this process. However STPA has predicted that there will be a short-term increase in the contaminant flux to the Harbour during the remediation, followed by a permanent and significant decrease. The Panel agrees with DFO, Environment Canada and Natural Resources Canada that STPA should complete an ecological risk assessment for Sydney Harbour to aid in designing mitigation and monitoring program. The Panel also recommends that STPA participate with the three federal departments in monitoring long-term environmental improvements in the Harbour.

THE INCINERATOR

STPA informed the Panel that decisions about the type of incinerator to be used have not yet been made, and during the hearings introduced the possibility that more than one

unit might be employed. STPA carried out a complete human health risk analysis using generic information based on meeting Canada-Wide emissions standards and other emissions criteria, and concluded that operation of the incinerator would have minimal effect on human health. Both government and public presenters questioned the uncertainty around equipment and pollution control technology.

Health was the predominant concern raised at the hearings. Issues included the reliability of modeling as a predictive technique for health risk assessment and the assumptions used to develop the model, the requirements for baseline population health information, the siting process and the selection of a separation or setback distance, the regulatory regime that would be applied to the incinerator, and the effectiveness of monitoring — especially whether it was possible to carry out continuous monitoring for dioxins and furans emissions. Presenters also questioned potential effects of emissions on streams and lakes in the area, particularly those that are water supplies. CBRM informed the Panel that Council had taken a formal position against incineration and supports the full containment alternative. Health professionals informed the Panel that, even though it might be possible to operate an incinerator without causing physical health effects, it would likely cause considerable stress and anxiety for some residents and also divisions within the community.

Accidents and malfunctions were another area of concern for some presenters, who questioned whether STPA's assumptions about the number and duration of upset incidents was reasonable, based on past experience with hazardous waste incinerators in other locations, and how much contamination would be released when bypasses occurred. Residents also told the Panel of problems with the operation of Sydney's former municipal solid waste incinerator, which was allowed to be

out of compliance for extended periods of time. Transportation spills were also mentioned as a concern, especially as the rail line runs along Grand Lake.

STPA stressed the conservative nature of the health risk assessment studies that they carried out, which were designed to systematically overestimate risks, for example by modeling five years of operation rather than three without mitigation by pollution control technology. They also described how malfunctions and upsets would be minimized and how the design of the incinerator would ensure that most contaminants would still be destroyed in the event of a bypass.

The Panel has recommended that as a first step, under the terms of the Canada's *Toxic Substances Management Policy*, STPA should carry out a risk benefit analysis to assess how management of PCBs in-place would compare to removal and destruction by incineration in terms of effects on ecological and human health. If the results of this assessment show that incineration is the preferred approach, the Panel has made a series of recommendations to ensure the safe design, operation and regulation of the incinerator. Once decisions have been made about the exact technology to be used, the Panel has recommended that STPA revisit air dispersion modeling and health risk assessment studies to identify any changes in conclusions. Other recommendations include the identification and use of the best available techniques and environmental practices as required by the Stockholm Convention, requiring full disclosure of bidders' track records when tendering for incineration services, bond requirements and increasing regulatory capacity. The Panel is also recommending that STPA develop a community consultation program to engage residents living near the proposed incinerator site.

SOCIAL, ECONOMIC AND COMMUNITY EFFECTS

STPA expects the Project to enhance development opportunities in Sydney and to provide social benefits for the whole region, by removing the stigma of the Tar Ponds, making land available for new uses, and creating employment and business opportunities. These benefits, combined with the reduction of both real and perceived health risks, are expected to boost CBRM's economic development potential and improve community well-being.

The Panel heard extensive support for the Project proceeding as quickly as possible, and with maximum local participation to ensure that economic benefits are retained in CBRM. The Panel has endorsed the Province's request for a comprehensive economic benefits plan for the Project including a monitoring program, and has also made recommendations regarding equity of access to employment.

The Project is predicted to increase truck traffic on the roads by approximately 150 vehicle trips daily. Tar Ponds sediments would be transported by rail to the incinerator at the Victoria Junction site, requiring one train trip with about 30 rail cars per day. The Panel has recommended development of a transportation management plan to establish procedures, address contractor compliance, monitor effects and mitigate any problems that arise. The Panel has also made recommendations regarding rail safety.

The capacity of the remediated Tar Ponds and Coke Ovens sites to support future uses was discussed extensively at the hearings, though it was evident that this issue had not been a key factor in selecting remediation approaches. STPA indicated that the sites would be able to support recreational and light industrial uses, provided that they maintained the integrity of the site caps and allowed for

ongoing management and maintenance. STPA agreed that if viable land uses could not be established, the sites might need to be fenced again at the conclusion of the remediation.

Public presenters told the Panel that commitments should be made to a future use plan as soon as possible. CBRM, with the support of business organizations, wants the sites to be part of a new Port to Port (harbour to airport) planning corridor for an industrial, business and technology park, but also to include an active transportation link (walking, cycling) between Whitney Pier and downtown. Others spoke to the need for future use to promote healthy outdoor living.

The Panel agrees that establishing viable and sustainable land uses will be vital if the Project is to deliver promised social and economic benefits, and has recommended that STPA collaborate with CBRM to develop a future use plan, and also to incorporate all feasible site enhancements, such as increased bearing strength and cap design improvements, into the Project design to enhance future use capacity. The Panel is also recommending that STPA set aside funds over 25 years to support the operation and maintenance of an open space and trail system on the Tar Ponds site in order to ensure the continued integrity and function of the encapsulation and drainage systems; recognize reclaimed estuarine habitat as a viable and self-maintaining future use and maximize its area; and begin planting trees on both sites as early as possible.

The Panel heard many concerns about past and possible future effects of living close to the Tar Ponds and Coke Ovens sites, and also fears about the effects of siting an incinerator would have on public confidence and well-being and on the community's reputation. The Panel has made numerous recommendations throughout the report to address these issues. In addition the Panel recommends special design

attention be paid to the perimeters of the sites and that a property value protection program be established.

CUMULATIVE EFFECTS

STPA assessed the potential cumulative effects of the Project in combination with the likely effects of future projects and activities that are either planned and are fairly certain to occur, or are reasonably foreseeable. STPA concluded that no significant cumulative effects are probable because Project construction activities and the operation of the incinerator will be short-term and because Project effects will be confined within a limited spatial area. The Panel concurs with this assessment.

ENVIRONMENTAL MANAGEMENT

The Panel observes that regulating the Project may be challenging because of its size and complexity, and because federal and provincial governments are involved both through their respective jurisdictions and because they own different areas of the Project sites. Therefore the Panel is recommending that the two governments develop a formal agreement to share expertise and coordinate regulatory processes. Given that some of the contaminants will remain on the sites for a very long time, if not in perpetuity, the Panel is also recommending that ongoing maintenance and monitoring be guaranteed through a provincial act of the legislature with provisions for reporting and accountability.

Other management and community involvement recommendations include requirements for a full monitoring plan to be approved before the Project starts, phased dispersal of federal funds tied to achievement of key steps in the Project, creation of an independent three-person Monitoring Oversight Board to carry out technical reviews and report to the public, and giving formal status, resources

and reporting responsibilities to an amended version of the current Community Liaison Committee.

1 INTRODUCTION

1.1 JOINT PANEL AGREEMENT

On June 7, 2005, the Canadian Environmental Assessment Agency (CEAA) and Nova Scotia Environment and Labour (NSEL) released a draft federal-provincial agreement for a joint panel review of the Sydney Tar Ponds and Coke Ovens Sites Remediation Project. A 30-day public comment period followed, inviting the public to review and submit comments on the draft agreement. The Joint Panel Agreement was signed by the Minister of the Environment for Canada and the Nova Scotia Minister of Environment and Labour on July 14th, 2005 (Appendix B). The agreement sets out the mandate and authorities of the Panel, its composition and Project review procedures.

On September 19, 2005, the Ministers appointed Lesley Griffiths (Chair), William H.R. Charles, and Louis LaPierre as members of the Joint Review Panel (Appendix A). Figure 1 illustrates the key steps in the review process.

1.2 PARTICIPANT FUNDING

The Canadian Environmental Assessment Agency administered a Participant Funding Program which supported individuals and non-profit organizations interested in participating in the environmental assessment. A total of \$200,000 in participant funding for the review of the Project was announced on May 27, 2005. Funding was available for two phases during the review. The first phase of available funding (\$50,000) supported public review of the Environmental Impact Statement (EIS) Guidelines. The remainder (\$150,000) was available to support participants in reviewing the EIS and to participate in public hearings.

The program was administered by an independent review committee and did not involve the Joint Review Panel.

1.3 ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

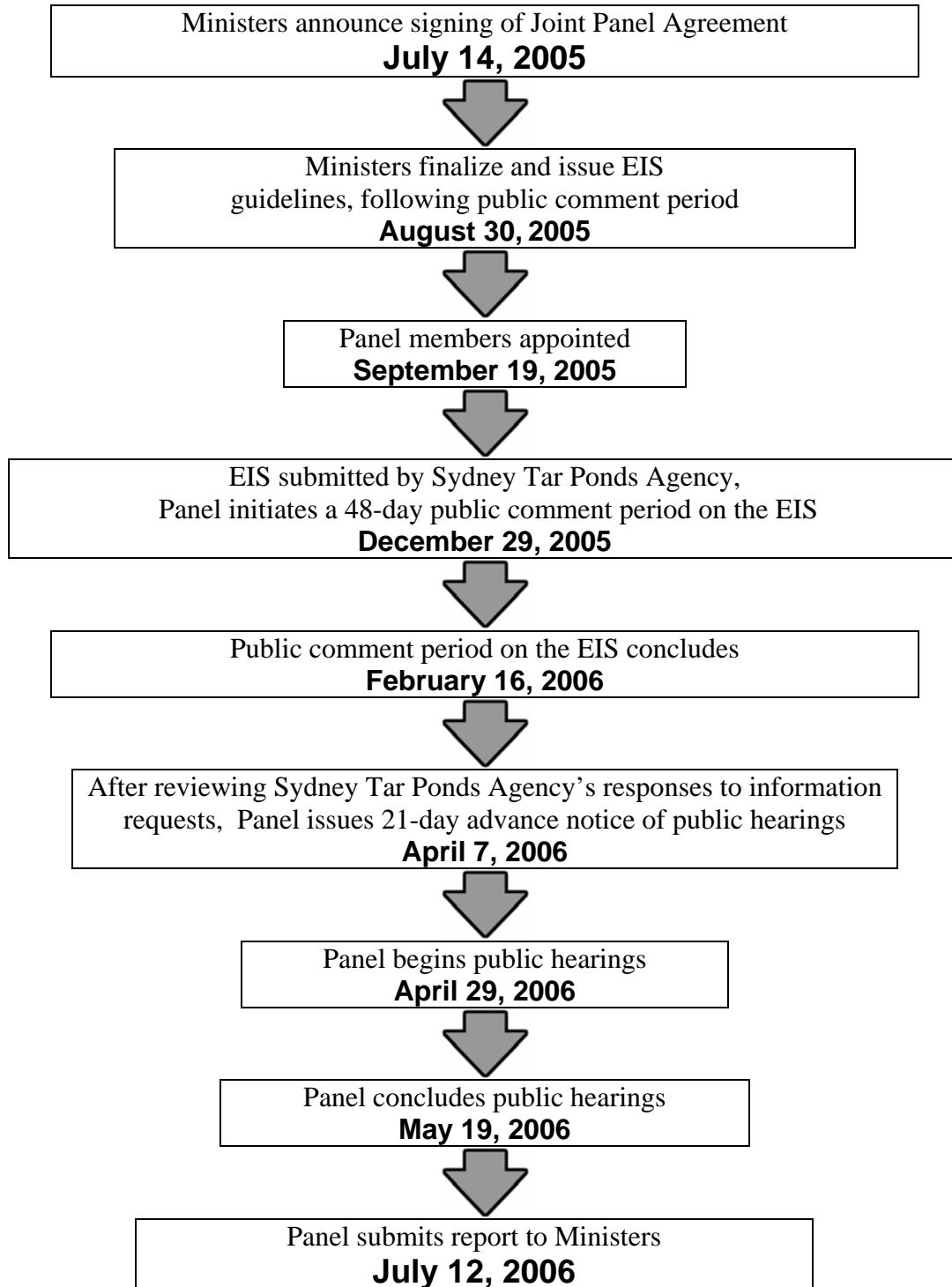
Draft guidelines for the preparation of an EIS were released on June 30, 2005 for public review and comment. The guidelines identified issues that the Proponent, the Sydney Tar Ponds Agency (STPA), was required to address in its EIS for the proposed Project. After considering public comments, the Guidelines were finalized by the Minister of the Environment for Canada and the Nova Scotia Minister of Environment and Labour on August 30, 2005. The Panel was not involved in drafting or finalizing the EIS Guidelines.

1.4 PUBLIC REGISTRY

For the purpose of facilitating public access to information related to the environmental assessment, a public registry under the *Canadian Environmental Assessment Act* was established in February 2005. The registry consists of a variety of documents, including background reports, submissions made to the Panel and official transcripts of public hearings. The registry was widely used during the review process. From the appointment of members to the Panel, the registry was maintained by the Canadian Environmental Assessment Agency with an extensive Project file being located in Sydney, Nova Scotia. The registry would continue to be accessible on the Canadian Environmental Assessment Agency's Web Site (www.ceaa-acee.gc.ca). Following the release of this report by the Joint Review Panel, the responsibility for maintaining the public registry would rest with

FIGURE 1

STEPS IN THE REVIEW PANEL PROCESS



Public Works and Government Services Canada (PWGSC).

1.5 ENVIRONMENTAL IMPACT STATEMENT

On December 28, 2005, STPA submitted a seven-volume EIS to the Panel. The Panel initiated a 48-day public comment period upon receipt of the EIS. The Panel reviewed the EIS and sought public input. The Panel considered all comments submitted by the public and stakeholders. This input became an important part of the information exchange between the Panel and STPA. Pursuant to the Joint Panel Agreement, requests for additional information by the Panel were issued to STPA within 14 days of the close of the public comment period on the EIS.

1.6 PUBLIC HEARINGS

On February 2, 2006, the Panel released a set of operational procedures for the conduct of public hearings. The procedures document provided a framework for public hearings including time allowances for presentations, details on the information exchange during proceedings how questioning would be conducted, and a general outline of the hearing schedule.

On April 7, 2006, the Panel announced that the necessary information had been received from STPA. The Panel determined that the EIS, background documents and STPA responses contained sufficient detail to support meaningful discussion at public hearings. Hearings began 21 days later on April 29, 2006. The Panel conducted public hearings over a period of 21 days as per the terms of the Joint Panel Agreement. During the hearings, the Panel heard from 34 registered participants, several of which involved delegations of presenters. A complete list of registered participants is attached in Appendix D.

The hearings allowed individuals, organizations and government representatives to provide their views on the implications of the proposed Project. This included participation through presentations, questioning and written submissions.

1.7 PANEL REPORT

This report is the final stage of the assessment process to be completed by the Panel and provides the Panel's findings, conclusions and recommendations to governments.

The Panel trusts that the community would take the report in the context and spirit in which it is intended — that is, to bring technical and community interests together in a thorough environmental assessment and to provide recommendations to decision makers eager to see a safe and effective conclusion to the remediation.

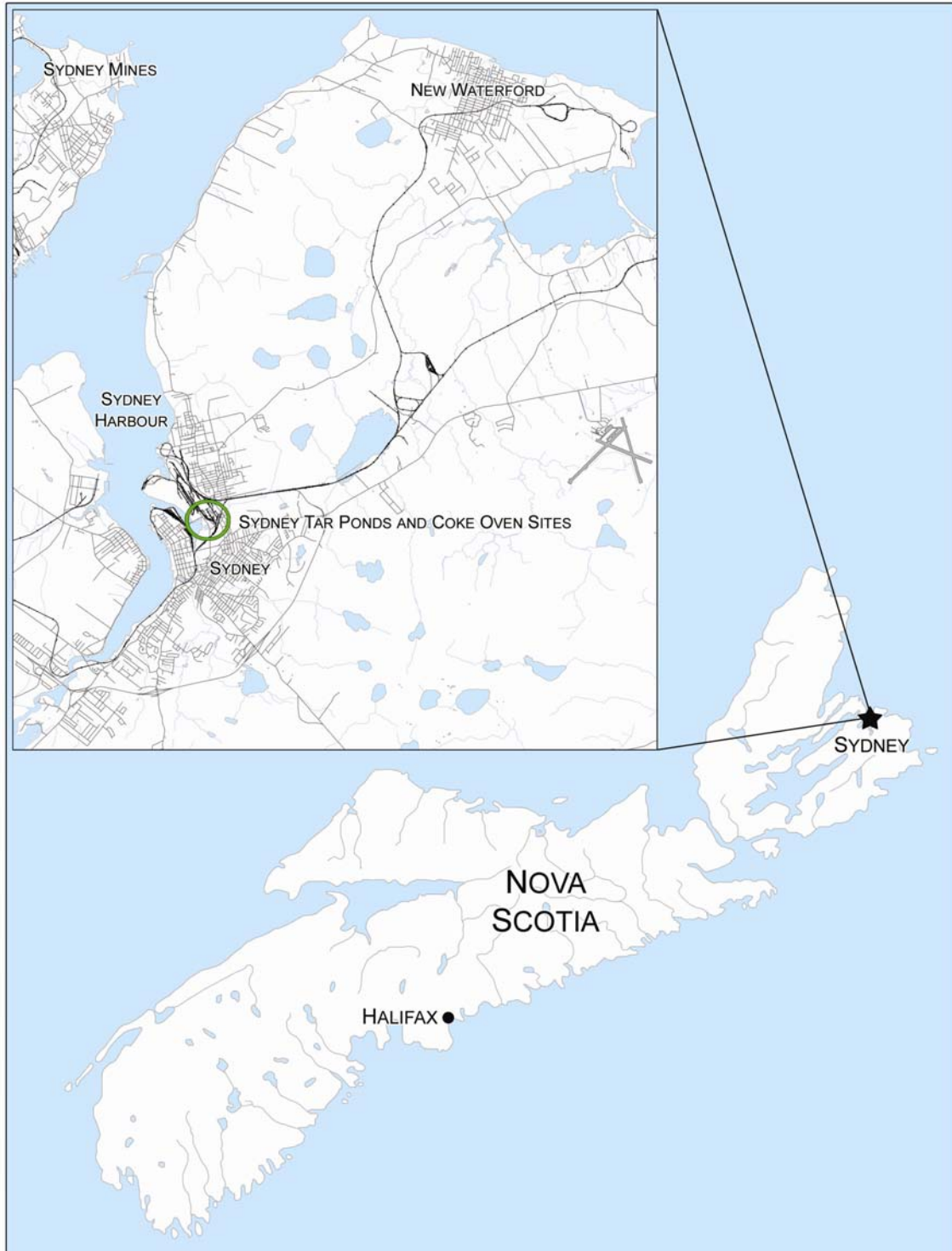
- Lesley Griffiths, Panel Chair
May 18th, 2006, Public Hearings Closing Remarks

1.8 PROJECT DESCRIPTION

The Project the Panel assessed is described in the Joint Panel Agreement. STPA is proposing to remove the removal of selected polychlorinated biphenyl (PCB) and polycyclic aromatic hydrocarbon (PAH) contaminated sediments from the Tar Ponds and Coke Ovens Sites, and to destroy the contaminated sediments in a temporary incinerator that would be located within the Cape Breton Regional Municipality (CBRM) (Figure 2). Sediments that remain in the Tar Ponds would be solidified and stabilized in-place. Watercourse diversion channels would redirect surface water flowing through the Tar Ponds site. At the Coke Ovens site, selected remaining contaminated soils would be treated in-place using landfarming, a form of bioremediation. Diversion channels and barrier

FIGURE 2

LOCATION OF REMEDIATION PROJECT



walls would reroute groundwater and surface water flowing through the Coke Ovens site.

At both sites a containment system of barrier walls and an engineered cap surface capping would be constructed to reduce exposure and to prevent the movement of contaminants away from the Tar Ponds site. The Tar Ponds site surface would be restored and landscaped in a manner compatible with the natural surroundings of the area and future site uses.

At the Coke Ovens site, selected remaining contaminated soils would be treated in-place using landfarming, a form of bioremediation. Diversion channels and barrier walls would reroute groundwater and surface water flowing through the Coke Ovens site. A containment system of barrier walls and soil cover would be constructed to reduce exposure to contaminants and to prevent the movement of contaminants from the Coke Ovens site. Coke Ovens site surfaces would be restored and landscaped in a manner compatible with the natural surroundings and future sites uses.

Pre-cleanup activities would include construction of parking lots, equipment and supply storage areas, security facilities, offices and washrooms, decontamination facilities for personnel, equipment decontamination pads, and isolation pads. A dedicated-use water treatment facility may be required. A temporary incinerator and associated facilities would be commissioned, requiring an area of approximately 2 to 5 hectares. STPA plans completion to complete of cleanup and capping of the Coke Ovens site by 2011, and the Tar Ponds site by 2014. Final uses of the Tar Ponds and Coke Ovens Sites are not part of the proposed Project.

1.9 INFORMATION ADEQUACY

Under section 34 of the *Canadian Environmental Assessment Act*, the Panel has the duty to ensure that all information required for the assessment is obtained and made available to the public. All of the information that the Panel has gathered has been made available through the public registry that was established for the Project (see section 1.4).

During public hearings, the Sierra Club of Canada stated in its closing remarks: "...in our view, [the Panel] has not yet obtained the information necessary to complete its assessment." The Sierra Club of Canada also stated: "...environmental concerns about the methodologies proposed by the Tar Ponds Agency raised in this hearing are so significant that further technical hearings would be required."

The Panel understands that under the *Canadian Environmental Assessment Act*, an environmental assessment of a project is to be conducted as early as is practicable in the planning stages of the Project and before irrevocable decisions are made. The Panel recognizes that a balance must be struck between the information that is available during the planning stages of a project and the information that would be available immediately before and during the implementation of a project. The Project before the Panel is still in its planning stages.

In submitting its report to the Minister of the Environment for Canada and the Nova Scotia Minister of Environment and Labour, the Panel is satisfied that it has gathered enough information to draw conclusions and make recommendations on the potential for the Project to result in significant adverse environmental effects. The Panel recognizes that there is uncertainty regarding the approach and methodology to be used by STPA in

implementing many aspects of the Project. The Panel took this uncertainty into consideration when developing the conclusions and recommendations found in this report.

2 THE PROJECT NEED, PURPOSE, AND ALTERNATIVES

The Panel was required by its Terms of Reference to consider:

- The “purpose of” and “need for” the Project;
- Alternatives to the Project; and
- Alternative means of carrying out the Project.

The Panel was guided by the *Operational Policy Statement on Addressing "Need for," "Purpose of," "Alternatives to" and "Alternative Means" under the Canadian Environmental Assessment Act.*

The proposed Project has been designed within parameters set by the Memorandum of Agreement Concerning the Remediation of the Tar Ponds and Coke Ovens Sites (MOA), the instrument by which the Government of Canada and the Province of Nova Scotia would fund and administer the remediation Project. The MOA makes reference to five Project elements:

- Removal and destruction of PCBs;
- In-place treatment of the remaining contaminated material using bioremediation and solidification
- Engineered containment of both sites;
- Site restoration and landscaping, and
- Ongoing maintenance and monitoring.

Alternatives to the Project were interpreted to include both the option of doing nothing, as well as remediation approaches that differed from the five Project elements defined in the MOA. *Alternative means of carrying out the Project* included different permutations and combinations of the five Project elements. STPA was not required to assess the environmental impacts of alternatives to the Project, but was required to assess the effects of any alternative means of carrying out the Project

that were considered to be both technically and economically feasible.

2.1 STPA ASSESSMENT

2.1.1 Purpose Of and Need for the Project

The EIS Guidelines directed STPA to:

- Describe the need for the Project;
- Explain the problem or opportunity that the Project is intending to solve;
- Clearly describe the fundamental rationale for the Project;
- Describe the purpose of the Project;
- Identify what would be achieved by carrying out the Project;
- Identify the main functions of the Project; and
- Identify who would benefit from the Project.

In the EIS, STPA stated that the overall purpose of the Project is to support the general commitment of the Governments of Nova Scotia and Canada to safe and healthy spaces by removing and destroying some of the contaminants from the Tar Ponds and Coke Ovens sites and containing the remaining contaminants. Recognizing that some improvements have already been made through ongoing cleanup activities, the Project is intended to “further reduce the potential health and ecological risk by removing, treating or isolating contaminants of concern.”

STPA also indicated that the Project has a second objective, namely to enhance the development potential and investment climate in CBRM and to provide social benefits for CBRM as a whole.

In response to an information request, STPA initially indicated to the Panel that the MOA would not permit a remediation approach that did not include PCB destruction. During the hearings, however, STPA told the Panel that they had consulted with the Department of Justice and now understood that the wording of the MOA (“...which shall not exceed the scope of work described in Section 1.2...”) allowed modification by removing Project elements specified in the Agreement, such as PCB destruction or landfarming, but not adding elements that had not already been identified in the EIS as alternative means of carrying out the Project.

2.1.2 Alternatives to the Project

In the EIS, STPA described the long history, beginning in the 1980s, of trying to develop a workable remediation plan for the Tar Ponds. This included a description of the Joint Action Group (JAG), a community-based approach to remediation of the Muggah Creek Watershed. JAG was a partnership supported under a Memorandum of Understanding between community representatives and the three levels of government in 1996. Based on the CCME National Guidelines for Decommissioning of Industrial Sites, JAG conducted numerous projects and studies, and several phases of community consultation. This included public input to the development of community evaluation criteria for the review of remedial options.

In 2003, JAG’s consultants completed the Remedial Action Evaluation Report (RAER), a comparative review of remediation technologies and approaches. After further consultation, JAG recommended that governments employ removal and destruction technologies in the remediation of the Tar Ponds and Coke Ovens sites. Subsequently, Environment Canada and STPA evaluated all of the RAER options and some additional options,

taking into consideration technical and economic feasibility, public acceptance, health and environmental impacts, socio-economic considerations and legal implications. The current Project was developed as a result of this evaluation, as were the options put forward in the EIS as alternatives to the Project, and alternative means of carrying out the Project.

Under the RAER process, remediation technologies needed to have the capability to address the following:

- The nature of the contaminants of concern;
- The media in which these contaminants are found within the Tar Ponds and Coke Ovens sites;
- The variation of physical, biological, and chemical conditions that can or would affect access to and the handling of these materials; and
- The physical and technical capacity to remove, prepare for treatment and dispose of each of these materials.

The RAER process first identified appropriate technologies and then used the performance criteria and key premises to determine which of those had the proven capacity to address contaminants of concern and to ensure the successful execution of the Project.

The performance criteria were:

- *Overall suitability:* This criterion looked at the expected results of applying the technology to the cleanup of the Tar Ponds and Coke Ovens material. Operational and performance characteristics of the technology were assessed against site-specific considerations;
- *Scale of application:* This criterion was an indication of the viability of the technology. The Project is large and

technologies should be known to be capable of operating at the capacity required, or have the capacity to be readily scaled up; and,

- *Status of development:* This criterion was a measure of the technology's proven record. It is important that technologies provide some confidence in their ability to perform the cleanup and a good track record is a solid indicator.

The key premises were that the technology should be:

- Able to reduce detrimental effects on the environment and health in the long-term by effectively modifying either the source or the pathway of specified contaminants of concern to a standard acceptable to regulatory agencies;
- Reliable, proven technology appropriate to and capable of implementation under conditions similar to those at the Tar Ponds and Coke Ovens site; and
- Cost effective when compared to other technologies that could achieve similar results.

Table 1 shows the alternatives to the Project as described by STPA.

STPA indicated that their evaluation was guided by the following key findings:

- The community wants proven technology to be used, but there is no consensus with respect to cleanup options;
- Co-burning contaminated soils and sediments at the Point Aconi power station was not acceptable to the residents of that area;
- There is considerable uncertainty as to whether any facility or community outside of Cape Breton would accept

materials from the Tar Ponds and Coke Ovens sites for destruction;

- Capping and containment, as well as incineration of PCBs, are both proven and widely used technologies;
- A cleanup strategy involving complete removal and destruction would be almost double the cost of the current Project and would involve greater uncertainty, technical complications and potential for nuisance impacts (noise, odours); and
- Both solidification / stabilization and bioremediation through landfarming, while not essential with respect to reducing ecological and human health risk, would add value to the Project and increase options for future use.

Removal and destruction of the higher concentrations of PCBs from the Tar Ponds would be consistent with pertinent international agreements, national policy and JAG's recommendation for the use of removal and destruction technologies as discussed in the EIS. Discussion of transportation routes is provided in Section 7.0 of the EIS.

2.2 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

The EIS Guidelines directed STPA to identify the alternate means by which the main Project activities could be carried out, and to identify the criteria or thresholds used to determine whether an alternative means was technically and economically feasible. As suggested in guidelines prepared by CEAA, examples of alternative means could include alternative locations, routes or methods of development, implementation and mitigation.

TABLE 1

ALTERNATIVES TO THE PROJECT AS DESCRIBED BY THE SYDNEY TAR PONDS AGENCY	
TAR PONDS	COKE OVENS
No remediation of the Tar Ponds site	No remediation of the Coke Ovens site
Excavation of North Tar Pond, containment in South Tar Pond	Excavation, bioremediation and containment
Excavation of both Tar Ponds, containment at Coke Ovens site	Excavation and containment
Excavation, soil washing, bioremediation, co-burning, and containment	Excavation, soil washing and co-burning
Excavation and co-burning	Excavation, pyrolysis and co-burning
Excavation and onsite incineration	Capping and containment only
Containment and capping of both ponds	Removal and destruction, bioremediation, and capping and containment
Removal and destruction, solidification / stabilization, capping and containment of both tar ponds	Incineration of all contaminated sediments from the Coke Ovens site
Incineration of all contaminated sediments in both Tar Ponds	

STPA indicated that alternative means of carrying out the Project were evaluated for the following strategic components:

- Control of surface water and groundwater (including treatment facilities);
- Removal and destruction of selected contaminants (including incinerator location);
- In-place treatment of selected contaminants;
- Containment of remaining contaminants; and
- Site surface restoration and landscaping.

In addition, STPA investigated alternatives for material handling and transportation methods and routes. STPA included alternatives for long-term monitoring and maintenance for each Valued Ecosystem Component (VEC) as part of the follow-up and monitoring requirements for the Project.

STPA initially indicated that, in assessing technical feasibility, they looked at technical suitability as well as whether alternative means met the aims of the Project component. In order to assess economic feasibility, they determined the relative cost of the alternative means (high, moderate, low) and its cost effectiveness. Cost effectiveness was considered to be the value gained – that is, the social, cultural, or ecological value gained from employing the alternative means.

In response to a Panel information request, STPA subsequently stated that "...cost and cost effectiveness were independently considered and were not given any quantitative weighting. While relative costs were quantifiable, cost effectiveness addressed how effectively each alternative achieved desired Project outcomes. In cases where it was determined that the alternative was not technically feasible, or was not an acceptable alternative because it did not achieve the desired

Project outcomes, a precise quantification of cost effectiveness was not necessary.”

2.2.1 Control of Surface and Groundwater

STPA stated that the aim of controlling surface water and groundwater is to ensure that they no longer come in contact with contaminants, or if they do, are appropriately treated. STPA indicated that surface and groundwater controls would be used to minimize the overall water treatment requirements, facilitate access to specific areas requiring remediation, mitigate potential impacts to receiving water bodies, mitigate potential exposures to onsite and offsite receptors, and prevent recontamination of the remediated areas. These controls would be implemented before, during, and after the remediation Project.

At the Tar Ponds site, STPA would control surface water by creating a new channel through Muggah Creek to accommodate the outflows of Coke Ovens Brook and Wash Brook so that surface waters are transported through the Tar Ponds in isolation from groundwater influx and other potential contamination. Two alternatives were proposed:

- 1) Single-channel construction, using the existing shoreline as a channel boundary, with sheet piling on the other side of the channel; or
- 2) Double-channel construction, with sheet piling and other construction materials on both sides of the channel.

STPA indicated that although isolation from contamination is more easily achieved with double-channel construction and the channel would not have to follow the shoreline of Muggah Creek, this approach double-channel construction approach is more expensive due to

the increased construction materials requirements and is not considered cost effective.

STPA indicated that a water treatment plant would be required to handle contaminated water from several sources. Alternatives that were considered include:

- A single treatment plant, located on the Coke Ovens site;
- A series of smaller independent treatment plants for each site; and
- The use of the existing plant at the SYSCO site.

STPA indicated that a water treatment plant at the Coke Ovens site would be a long-term fixture for treatment of contaminated groundwater and would probably be required whether or not other treatment plants are also used. STPA stated that the advantages of a single treatment plant are reduced capital and operating costs, but these costs could be offset by the increased pipeline or transportation requirements between sites. STPA also indicated that water treatment facilities are currently available on the SYSCO site, but are not able to treat all waste water streams from the Project. Multiple treatment plants would have the advantage of dealing with the various waste water types on site.

STPA indicated that all of these options are technically and economically feasible, but that as yet no decision has been made on the preferred means.

2.2.2 Removal and Destruction of Selected Contaminants

STPA indicated that the aim of this component is to destroy PCBs in the Tar Ponds, as well as PAHs in the Tar Cell at the Coke Ovens site and contaminated sediments in Coke Ovens Brook. STPA would transport selected

sediments contaminated with greater than 50 ppm of PCBs from the Tar Ponds, the contents of the Tar Cell, and the sediments excavated from Coke Ovens Brook, to a temporary incinerator constructed at the VJ site.

STPA engaged a consulting firm to undertake a technical and cost evaluation of all possible alternatives to a temporary incinerator for managing the material slated for incineration, using the methodology for technology evaluation as set out in the RAER. Forty technologies were evaluated through three screening levels, which yielded the preferred alternative.

At the hearings, STPA indicated that if all the contaminated sediments from the Tar Ponds and Coke Ovens sites were to be incinerated at the VJ site, the cost of this alternative would be \$748.5 million, and was therefore not economically feasible.

STPA identified and evaluated ten potential temporary incinerator site locations within CBRM. The selection process was based on two primary principles:

- Protection of public health and safety and the environment is paramount and a prerequisite to the acceptance of any site; and
- Social, technical, and economic considerations, although important to the overall viability of a site and the Project, are secondary in comparison to health, safety, and the environment.

Key criteria used by STPA for the choice of incinerator sites included:

- Must be within 20 km of the Tar Ponds and Coke Ovens sites;
- No residence located within 500m of site's property boundary;

- Must be owned by the Federal, Provincial, or Municipal governments (private land would not be considered); and
- Must be greater than 2 ha in area.

Based on these criteria, the Tar Ponds or Coke Ovens sites were not included in the ten sites evaluated.

Two possible locations ranked highest: the former Victoria Junction (VJ) Coal Preparation Plant close to Grand Lake, and the Phalen Mine site east of New Waterford. STPA indicated that both sites are located away from large urban areas, were previously industrial sites and have rail access. STPA stated that the VJ site is the preferred site due to proximity and ease of access; however, the use of the Phalen site is also technically and economically feasible.

2.2.3 In-Place Treatment of Selected Contaminants

STPA stated that the aim of the treatment of in-place contaminants is to reduce the risk of the remaining contaminants through stabilization and, where possible, render them inert. Methods to be used at the Tar Ponds and Coke Ovens sites would differ due to the characteristics of the sites.

At the Tar Ponds site, STPA stated that treatment would include in-situ solidification / stabilization with a reactive agent. STPA indicated that the only alternative to this would be containment without solidification / stabilization, but this would not meet the aims of the Project. STPA would treat contaminants in-place at the Coke Ovens site through bioremediation by landfarming. STPA indicated that landfarming would be a short-term operation, and that they were uncertain how successful it would be in reducing PAH contamination. Two alternatives were

acknowledged. Landfarming could be carried out in engineered cells instead of in-place; however, the cost of this would not be economically feasible. The site could also be capped without landfarming. STPA stated that while this would contain the remaining contaminants, it would not destroy them, thus not meeting the Project aim. STPA further clarified at the hearings that destruction of contaminants did not necessarily need to form part of the purpose of the Project.

2.2.4 Containment of Remaining Contaminants

Containment is intended to create physical barriers between the remaining contaminants and possible receptors (humans, plants, and animals). STPA indicated that the caps on the Tar Ponds and Coke Ovens sites would be designed to limit the migration of contaminants upwards to the environment and potential receivers and to limit the infiltration of precipitation through the cap. The cap would also limit the potential for plant roots and burrowing animals to physically penetrate the cap. STPA indicated that there is no other viable alternative to capping in order to contain the remaining contaminants and ensure that the Tar Ponds and Coke Ovens sites are healthy environments for humans and wildlife.

2.2.5 Site Surface Restoration and Landscaping

STPA indicated that the aim of this component is to make the sites available for alternative land uses. A final site use plan has not yet been developed and is not part of this Project. STPA plans to grade both sites and put down a layer of topsoil, and did not present any alternative means of carrying out this component.

2.2.6 Material Handling

Contaminated materials removed from the Tar Ponds and Coke Ovens sites would be transported by railcar to the offsite incinerator, where the materials would be prepared for incineration and then destroyed. Two approaches for handling the material were considered by STPA. The first was a conventional approach, whereby the conditioned material is loaded onto rail cars via an enclosed conveyor system. The second approach was to use closed steel containers that are filled directly onsite and then moved onto the railcars. STPA indicated that both options are technically and economically feasible, and the final decision as to which would be used has not been determined.

2.2.7 Transportation Methods and Routes

Two transportation methods are considered by STPA for the transportation of material to and from the Tar Ponds and Coke Ovens sites. STPA indicated that contaminated materials slated for incineration would be transported by railcar to the offsite incinerator where the materials would be prepared for incineration and then destroyed. All major construction, backfill, and cap materials would be transported to the sites by highway-licensed tandem, tri-axle, and tractor trailer trucks. Both methods of transport are considered technically and economically feasible, and are discussed in the EIS.

2.3 GOVERNMENT AND PUBLIC CONCERNS

The Panel heard considerable discussion about alternatives during the hearings. Some presenters were opposed to incineration, and favoured total encapsulation without removal and destruction of some of the PCB contaminated sediments. More information

about these arguments can be found in Chapter 4, Incineration. Others opposed a strategy that would only remove and destroy some of the contaminants, arguing that this was contrary to the previously stated wishes of the community.

When, during the hearings, STPA indicated that that they now believed that removing the incineration component and using a total encapsulation approach would meet the intent of the MOA and could therefore be considered a valid alternative means of carrying out the Project, rather than an alternative to the Project, presenters challenged whether leaving all of the PCBs in-place would meet the *Stockholm Convention on Persistent Organic Pollutants* and *Canada's Toxic Substance Management Policy*. Environment Canada informed the Panel that both the *Stockholm Convention* and the *Toxic Substance Management Policy* permitted use of a risk benefit assessment to determine whether PCBs should be removed and destroyed or managed in-place.

In addition, two technology vendors appeared before the Panel to put forward proposals to use their technologies as alternative means of carrying out the Project.

2.3.1 TDE Proposal

The proposal by TD Enviro Inc. / Thermo Design Engineering Ltd., St. Lawrence Cement Group, and Envirotech Consulting Inc. (collectively known as TDE) involves a modification of "Option 3" that was described in the RAER. At the Tar Ponds site, RAER option 3 would involve the ex-situ treatment, destruction, and containment of contaminated sediments. PCB-contaminated materials (greater than 35 mg/kg) would be separated, treated to concentrate contaminant levels, and destroyed offsite. At the Coke Ovens site, RAER Option 3 would involve the excavation of the contaminated fills and sediments with COC

concentrations exceeding the SSTLs from the site, removal of the contaminants through a soil washing treatment, and the subsequent destruction of the concentrated contaminants.

According to TDE, the key modification to RAER Option 3 is the replacement of dredging with dewatering and sealing the Tar Ponds surfaces to prevent the escape of odours, followed by excavation of the contaminated sediments. Under the TDE proposal, the generic soil washing technology described in RAER Option 3 would be replaced with a specific technology, the "Clean Soil Process" (CSP).

TDE indicated that the modifications to RAER Option 3 would eliminate the need for one or more landfills at the Coke Ovens site, containing approximately 730,000 tonnes of contaminated material. TDE stated that over 300,000 tonnes of the contaminated materials could be converted to a carbon fuel source by using CSP. The carbon fuel would pass the Toxicity Characteristic Leaching Procedure/Leachate Extraction Procedure (TCLP/LEP) tests for organics and metals and would be used for co-firing at the St. Lawrence Cement kilns in Joliette, Quebec. The balance of the material (about 430,000 tonnes) would be converted into an organics-free, non-leachable, clean mineral matter, which could be used onsite as clean fill or construction material.

TDE told the Panel that any sediment containing over 35 ppm of PCBs would be subjected to pyrolysis or low-temperature indirect thermal desorption, which would concentrate the PCBs in the form of a liquid to be destroyed offsite in a stationary incineration facility, by hydrogenolysis, or by other means.

In its April 2006 submission to the Panel, TDE indicated that the cost of their proposal would be \$392 million (+/- 5%). TDE reiterated this cost estimate at its May 16, 2006 appearance before the Panel at public hearings.

2.3.2 Kipin Industries Proposal

A second vendor, Kipin Industries, proposed a combination of two alternative treatment technologies: synthetic solid fuel production and plasma vitrification. Plasma vitrification uses electricity to create a high-temperature plasma arc at more than 7000°C. The process breaks down the organics and then combines them into simple gases such as carbon dioxide. The remaining material is liquefied and cooled to form a non-leachable slag-type residue that can be safely disposed. No incineration is involved.

In its submission to the Panel made on May 17, 2006, Kipin Industries stated that plasma vitrification technology was assessed and recommended as an alternative by STPA consultant EarthTech in the EIS list of alternative technology assessments filed in December 2005. Kipin Industries told the Panel that the technology met the technical criteria but STPA considered it too costly to apply to the entire Project by itself.

However, STPA indicated in Appendix E of the EIS that vitrification was screened out of the technology selection process because it could not "...provide at least a 10 tonnes per hour throughput or process rate for ex-situ processes and 10 year target cleanup to meet SSTLs or exposure pathway mitigation for in-situ processes." The EIS also indicated that plasma units are typically low capacity. The largest unit that has been identified is MSE Technology's 24 tpd unit. Smaller units would be limited to the destruction of smaller quantities of concentrated contaminants, and therefore vitrification was removed from further consideration as a primary technology. When questioned by the Panel, Kipin Industries indicated that the largest quantity of PCB contaminated material treated with plasma vitrification was several hundred tonnes.

The second part of Kipin Industries' proposal involved synthetic fuels technology that would process and recycle waste coals, coal fines and coke. The coke products, together with the tar and coal wastes, would be converted by a chemical process into a fuel product that can be sold to power plants. Kipin Industries views coal and tar wastes as a recyclable asset. Based on the information presented by Kipin Industries, the cost estimate of converting the non-PCB contaminated waste to a synthetic fuel with site restoration to be \$150 / tonne (USD).

The EIS states that Colmac Resources Inc. examined co-burning of high PAH sediment with low PCB concentrations and produced good results for the destruction of PAH material during the Technology Demonstration Program. The ash produced had a high metal content that might limit disposal options. Gas emissions during the pilot test did not meet the required destruction efficiency; however, it was noted that increased residence times and excess air would ensure complete combustion.

2.4 PANEL CONCLUSIONS AND RECOMMENDATIONS

The EIS Guidelines for the Project established by Canada and Nova Scotia direct STPA to undertake an "analysis of alternatives to the Project [which] should establish the broad concepts or remediation plans that were considered in the process of developing the Project, the criteria considered by STPA in evaluating those broad concepts or plans and in determining STPA's preferred Project." Reviewing the information put forward by STPA, the Panel is satisfied that the "alternatives to" the Project were adequately considered by STPA.

The Panel's mandate requires them to assess the environmental effects of alternative means of carrying out the Project that are

technically and economically feasible. Therefore the Panel is faced with the fundamental question of what can legitimately be construed as feasible alternative means.

In the EIS, the only alternative means put forward by STPA were relatively minor variations of the main Project components. However, the Panel also heard from other presenters that the Project should be revised to:

- Omit incineration, and totally encapsulate the contaminants; or
- Omit both incineration and encapsulation, and remove and destroy all contaminants by some other means; or
- Some combination of the two.

Towards the end of the hearings STPA asserted that, contrary to the conclusion they had drawn in the EIS, total encapsulation without incineration was a legitimate alternate means of carrying out the Project.

In order to test the validity of this assertion, and also to determine whether a remediation approach involving total removal and destruction with no encapsulation could also be considered an alternative means of carrying out the Project's purpose, the Panel addressed the following questions:

- Is removal and destruction inherently part of the Project's purpose?
- Do the terms of the MOA allow any deviation from the Project described in the MOA?
- Is STPA obliged by the requirements of international conventions or national policy to remove and destroy the PCBs?

The Panel understands that managing PCBs in-place can, under certain circumstances, meet Canada's obligations under the Stockholm Convention and conform to *Canada's Toxic*

Substances Management Policy. Therefore removal and destruction of PCBs is not mandatory.

Based on the information brought forward by STPA and Public Works and Government Services Canada (PWGSC), the Panel concludes that the need for the Project is properly stated as "the need to reduce the ecological risk posed by the contaminants in both the Tar Ponds and Coke Ovens sites." Therefore, the Panel concludes that the purpose of the Project is to remediate the Tar Ponds and Coke Ovens sites in such a manner that the risk posed by the contaminants is reduced. In other words, PCB removal and destruction is not part of the purpose of the Project and therefore need not necessarily be a component of the Project.

STPA told the Panel that the signatories to the MOA had advised them that the wording of the MOA was intended to allow STPA the flexibility to remove a remediation component specified in the Agreement, but not to add a totally new component. Therefore, the Panel concludes that both total containment without removal and destruction of contaminant, and total removal and destruction without containment could be justifiably considered as alternative means of carrying out the Project.

STPA told the Panel that they determined economic feasibility by comparing costs of different technologies in a relative rather than absolute manner. The Panel found STPA's response to be somewhat confusing and takes a more prescriptive view of economic feasibility. In response to an information request before the hearings, STPA indicated that the capital cost of the Project would be \$322 million. Further clarification provided by STPA at the hearings indicated that the capital cost would be \$327.5 million. This figure was confirmed by PWGSC as being the total funds available to implement the Project. The Panel therefore concludes that the threshold for

economic feasibility is the capital cost of the Project, being \$327.5 million.

STPA has projected the cost of the total “full containment, no incineration” alternative as \$312 million. Therefore the Panel accepts that this alternative means is economically viable. Chapter 5 details the Panel’s comments on the technical viability of this alternative means of carrying out the Project and on the associated environmental effects.

The Panel asked STPA to provide the cost of total removal and destruction of the contaminants using incineration. STPA indicated that this would be \$748.5 million, and therefore not economically viable. The Panel also accepts this conclusion.

In the case of the two modified versions of RAER option 3, TDE presented the Panel with a detailed cost estimate comparing items line by line with the RAER cost estimate. The total amount exceeded STPA’s feasibility threshold by approximately 20%. The Panel also notes that all RAER estimates had been subsequently revised by PWGSC, adding allowances for risk management, and various Project management functions. While the results of these revisions were disputed by TDE and other presenters, the Panel notes that the cost estimate provided by TDE, based on the items outlined in the RAER, may not include all Project management components. The Panel therefore concludes that the TDE proposal, as presented at the hearings, is not economically feasible and therefore not an alternative means of carrying out the Project.

The Panel also notes that STPA rejected RAER option 3 as an alternative means of carrying out the Project because it was deemed to have increased health and environmental impacts because of increased excavation, a limited technology track record, high remediation risk, long duration, high liability

and high cost with low probability of success. During the hearings, STPA also told the Panel that they doubted whether any community would allow fuel products derived from the Sydney Tar Ponds and Coke Ovens sites to be co-burned in a facility near them.

Kipin Industries did not provide a detailed cost estimate to the Panel, but did assert that their proposal could be carried out for \$290 million. The Panel notes that the plasma vitrification process included in the Kipin Industries proposal was ruled out of consideration by STPA because it would not be able to handle the volumes of material in the required time. The Panel concludes that the Kipin Industries proposal, as presented at the hearings, is not a viable alternative means of carrying out the Project.

The Panel is satisfied that the process used to identify technically viable remediation technologies under the RAER provided sufficient parameters and thresholds to determine technically viable remediation approaches.

The Panel believes that STPA took a narrow approach when examining the alternative means of solidifying and stabilizing the sediments, which should also include the use of different materials or approaches to solidify and stabilize the sediments. However, the Panel is satisfied that this information was presented in the EIS or during the hearings.

Similarly, based on the view that destruction of contaminants need not necessarily form an integral component of the Project, the Panel concludes that only capping portions of the Coke Ovens site without landfarming (which would destroy some of the lighter hydrocarbons) is a technically and economically viable alternative to the combination of capping and landfarming.

The Panel was advised by Environment Canada that, under the federal *Toxic Substances Management Policy*, PCBs are considered a Track 1 substance and that one of the objectives of policy is virtual elimination from the environment of such substances. With respect to contaminated sites the policy states:

Remediation may be undertaken when a Track 1 substance is already in the environment. For sites under federal jurisdiction that are contaminated by a Track 1 substance, management plans will consider the elimination of that substance, based on an analysis of risks, costs and benefits. Where the benefits to the ecosystem or to human health of removing the substance outweigh cleanup costs — including the possibility of further environmental degradation — remediation will be considered. Otherwise, management strategies will focus on minimizing exposure and the site's potential risks.

Based on information presented to the Panel on landownership the Panel notes that all or virtually all of the PCB hotspot in the North Pond is contaminated by a Track 1 substance and that the hotspot is located on federal land. Therefore the Panel concludes that the *Toxic Substances Management Policy* is directly relevant to the Project.

The EIS states that “removal and destruction of the PCB contaminated sediments is consistent with the Government of Canada’s *Toxic Substance Management Policy*.” However, the Panel does not believe that statement is fully supported as the benefits to human health or to the ecosystem of removing the North Pond PCB hotspot have not been clearly shown to outweigh cleanup costs.

To its credit STPA’s EIS defines human health broadly:

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

The Panel concludes that, relying on STPA’s definition of health, removal of incineration from the Project will prevent a source of stress within a community and thereby will be beneficial to health. The Panel notes that the *Toxic Substances Management Policy* states that, in implementing this policy, federal departments will follow and promote consideration of socio-economic factors when choosing management strategies. Regardless of how health is defined, and recognizing the information presented to the Panel on the incinerator and stress within the community, the federal departments involved in this Project must give careful consideration to the social implications of incineration.

The Panel believes that, with respect to the *Toxic Substances Management Policy*, the information presented to the Panel for its consideration is most deficient in the area of ecosystem and human health and the associated benefits of remediation. The Panel described earlier its concerns with the potential increased leachability of organic contaminants, PCBs included, as a result of solidification / stabilization of Tar Ponds sediment. If this potential problem were to occur, the effects on environmental quality in Sydney Harbour would be aggravated and the global problem of PCBs in the environment would be slightly worsened.

More important than the potential release of PCBs by way of solidification / stabilization is the lack of quantitative information on the fate of contaminants, PCBs included, released to Sydney Harbour both during and following remediation. A similar concern was identified by the public and three science-based departments with expertise in marine environmental quality. While the analysis is not identical to a study requested by

the three federal departments, it addresses the same weakness in the proposed Project – a lack of demonstrated understanding of the ecological effects of the short- and long-term effects of remediation.

The Panel acknowledges that it heard directly from the federal department responsible for providing technical and scientific advice on the federal *Toxic Substances Management Policy*, who found no problem with the Project's consistency with the policy. Nevertheless, the Panel respectfully disagrees with this interpretation and concludes that the Project must be consistent with the *Toxic Substances Management Policy* and that STPA has not yet demonstrated the required consistency.

Recommendation #3

Toxic Substances Management Policy

The Panel recommends that Environment Canada, with the assistance of Health Canada, provide advice to PWGSC to ensure the Project is in full compliance with the *Toxic Substances Management Policy*. The federal departments should ensure that an analysis of risks, costs and benefits is completed of the North Pond PCB removal alternative. That analysis should give appropriate consideration to social issues. The results of the analysis should determine if the PCBs in the North Pond hot spot are to be removed or if minimizing PCB exposure and the site's potential risks are to be addressed by way of the *Full Containment, No Incineration* project alternative. The Panel recommends that PWGSC and NSEL require STPA to conduct the same analysis of South Pond PCBs.

The Panel has recommended that as a first step, under the terms of the Canada's *Toxic Substances Management Policy*, STPA should carry out further analysis of risks, costs and

benefits of the PCB removal and incineration option. If the results of this assessment show that removal and incineration is the preferred approach, the Panel has made a series of recommendations to ensure the safe design, operation and regulation of the incinerator.

3 ENVIRONMENTAL ASSESSMENT BOUNDARIES

3.1 ENVIRONMENTAL ASSESSMENT BOUNDARIES

Defining the boundaries for the environmental assessment establishes a frame of reference for assessing environmental effects and facilitates their identification. Through the Joint Panel Agreement, the Panel is required to assess the temporal and spatial boundaries of the study area(s) in the environmental assessment of the Project.

3.2 STPA ASSESSMENT

Part 1 of the appendix to the Joint Panel Agreement defines the Project that the Panel is to assess. While silent on the physical boundaries of the Project, it is clear that the Project has been proposed as a result of the MOA and the Project Description that was prepared in December 2004. Section 1.3 of the MOA indicates that the Project Description would also include a description of the legal survey boundaries of the sites. Figure 2.2 in the Project Description document shows the land ownership of the area intended to be remediated by STPA.

STPA indicated that VEC-specific temporal and spatial boundaries were developed to encompass those periods during which, and areas within which, the VECs are likely to interact with or be influenced by the Project.

During its review of the EIS, the Panel requested STPA provide additional information on how boundaries for each VEC were derived. The Panel asked STPA to indicate which VECs have a temporal boundary of 25 years, and explain how the anticipated environmental effects for that VEC related to the 25 year boundary. The Panel also asked STPA to

indicate how contaminants that remain at both Tar Ponds and Coke Ovens sites are expected to change over the 25 year period following completion of the Project and identify the potential need for further mitigation, monitoring and maintenance following the expiration of the 25 year period identified in the MOA.

In response to the Panel's request for additional information, STPA stated that "...interactions of the Project with the biophysical and socio-economic environment would continue long after the current Memorandum of Agreement has expired, (i.e. more than 25 years)."

STPA provided information regarding the expected rate of decay for contaminants remaining on the two sites in the form of a table showing expected half-lives. Both STPA and Environment Canada agreed that the figures provided assumed "normal" conditions, in which contaminants were exposed to both air and water. How these estimates would relate to contaminants under a soil cap on the Coke Ovens site, or solidified in a cement matrix in the Tar Ponds, is uncertain.

STPA also indicated that over time, the environment at the Tar Ponds and Coke Ovens sites would reach an equilibrium or stasis condition where no major changes in the chemical, physical and ecological components of the sites are likely. STPA concluded that a monitoring program would be an integrated part of an adaptive management plan to verify impact predictions and inform potential modifications to the mitigation program as necessary over the life of the Project until regulatory officials are confident that any residual Project related risk remains at acceptable levels.

During the public hearings, STPA indicated that the proposed Project represented a “walk away solution” as the contaminants that remain at the Tar Ponds and Coke Ovens sites would eventually no longer pose a risk.

3.3 PUBLIC CONCERNS

During the course of the hearings, the Sierra Club of Canada asserted that “PCB and PAH contaminated materials [can be] found under the slag on the east side of the [Tar] ponds.” The Sierra Club of Canada also indicated that the physical boundaries of what is considered to be the “Tar Ponds” should extend under the slag pile to the east of the north Tar Pond. In addition Sierra Club emphasized that previous air dispersion of contaminants from the Coke Ovens, when they were still in operation, would have caused effects over a wide area of Sydney, and that therefore STPA should first identify the spread of contaminants from the steelmaking industry, and then develop a strategy to clean it up.

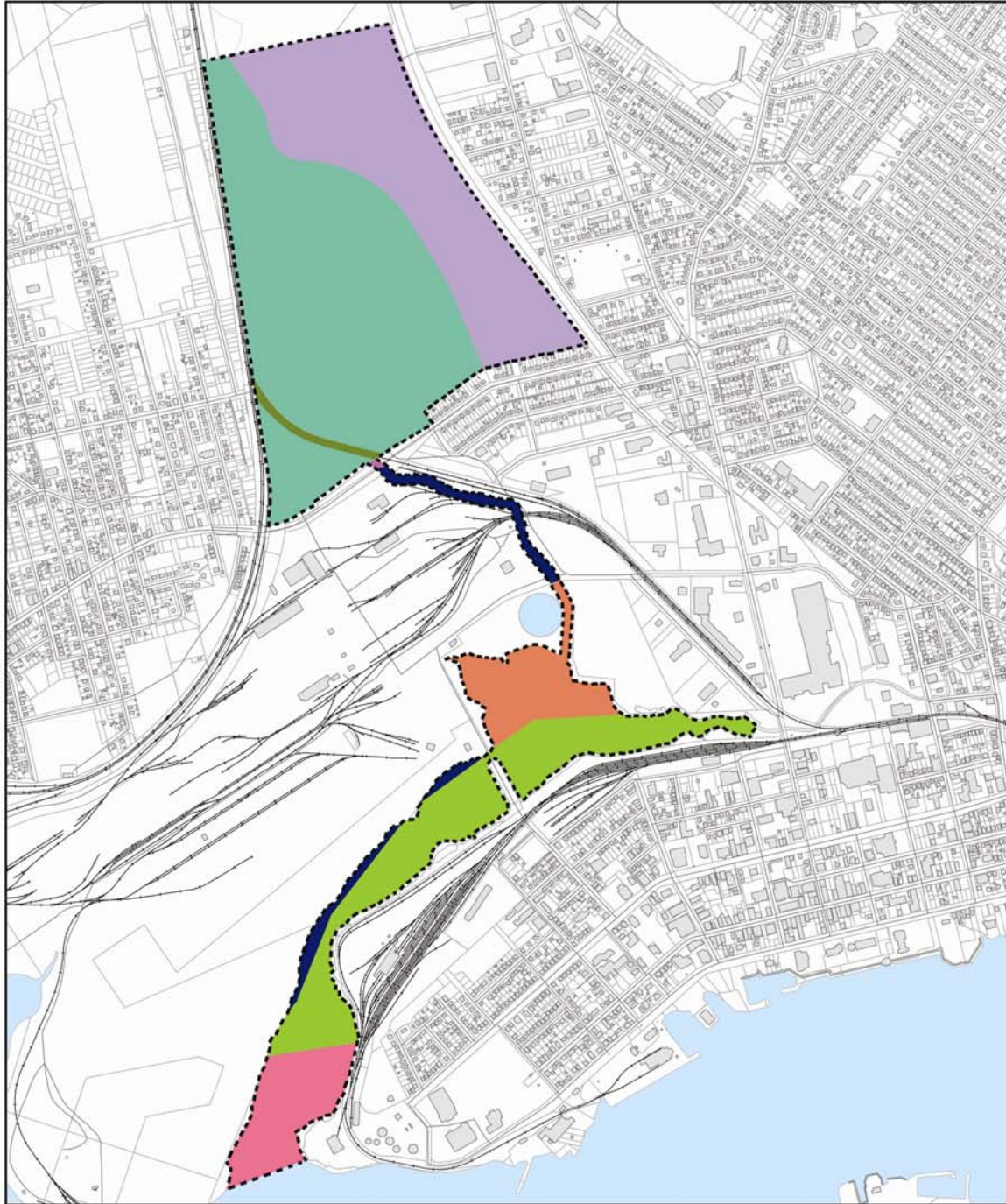
3.4 PANEL CONCLUSIONS

The Panel does not question that there may be contaminants found outside of the areas that are proposed to be remediated by STPA. However, the Panel is mandated to assess the

effects of the Project described in the Joint Panel Agreement. The physical boundaries of the Project were defined by STPA; the physical boundaries of which are shown in Figure 3. The Panel is not prepared to comment on whether additional remediation work is to take place outside of the areas defined by STPA.

The Panel believes that the temporal boundaries of the Project are more uncertain, that the decay of contaminants on the Coke Ovens site may take longer than suggested by the information on half-lives provided by STPA, and that solidification / stabilization may prevent or significantly retard the decay of contaminants in the Tar Ponds.

Given STPA’s reliance on capping, surface water and groundwater collection systems, and the potential need for long term water pumping and treatment, the Panel is of the view that the Project would require long term (greater than 25 years) commitments to ensure the integrity of these systems. The conclusions and recommendations in other sections of this report reflect the Panel’s view on the need for these long-term commitments. The Panel also concludes that, rather than providing a “walk away” solution, the Tar Ponds remediation may need to be managed in perpetuity.



**FIGURE 3
TAR PONDS AND
COKE OVENS
LAND OWNERSHIP**



0 200 400m

LEGEND:

- ++ Active railroads
- Road
- Watercourse
- - - Remediation Site Boundary

LAND OWNERSHIP

OWNER NAME:

- Canadian National Railway
- Cape Breton Development Corp
- Her Majesty the Queen
- NS
- NS Economic Development and Tourism
- NS Sysco
- Government of Canada
- Road Parcel Owner
- Undetermined
- Government of Canada, subject to an unresolved general jurisdictional dispute between Canada and the Province of Nova Scotia over ownership of all submerged lands surrounding the Province.

4 TAR PONDS AND COKE OVENS REMEDIATION

4.1 THE COKE OVENS SITE – EXISTING CONDITIONS

The Coke Ovens site is approximately 68 ha in area, bounded by the residential area of Whitney Pier to the north, the SYSCO property to the west, the Municipal Ash Industrial Disposal (MAID) site to the east, and the Ashby residential area to the south. The Coke Ovens site is crossed by Coke Ovens Brook, which enters the site from the east and makes its way westward across the site and then south of the SYSCO property where it discharges into the South Tar Pond. The site includes the Coke Ovens Brook Connector, a 4.1 ha corridor.

Past activities on the Coke Ovens site have included almost 100 years of coke production and the use of by-products of the coking operations in the manufacture of other products. Surface structures and materials have been removed from the site but substantial buried infrastructure remains.

The EIS states that there are an estimated 560,000 tonnes of soil on the Coke Ovens site contaminated with, PAHs, petroleum hydrocarbons and metals and 1,300 tonnes of Coke Ovens Brook sediments contaminated with PAHs. There are also coal tars distributed across the site but concentrated in the northeast corner of the site and on the bed of Coke Ovens Brook.

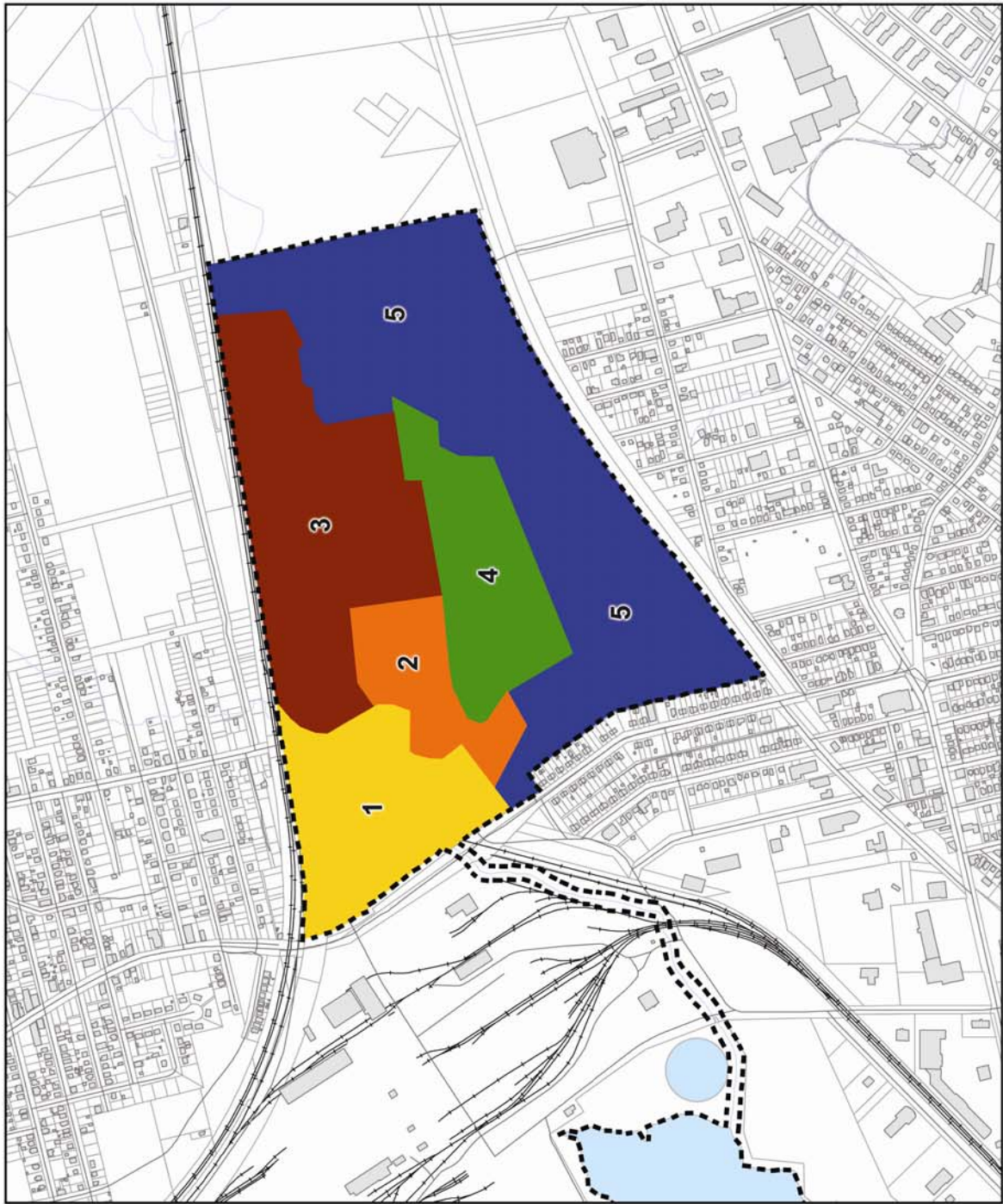
For the purposes of assessment, STPA divided the Coke Ovens site into five areas (Figure 4). Area 1, the former Domtar site, includes the in-ground Tar Cell containing 25,000 tonnes of tars and contaminated soil, and other widespread coal tars. There are also 1,300 tonnes of contaminated sediments along Coke Ovens Brook and the Coke Ovens Brook Connector. Coal tars are dense non-aqueous

phase liquids (DNAPLs), which means that they are heavier than water and tend to sink until they reach a confining layer that restricts their downward migration.

PAHs and BTEX compounds are the dominant groundwater contaminants in this area. Offsite contaminant migration is to the west-southwest on to the SYSCO property and the Coke Ovens Brook system via groundwater in shallow bedrock.

Area 2 was the location of the Coal Pile Runway and the Coal Plant Battery. Coal tar has been identified in localized areas where there was no till, in portions of the Coke Plant Battery foundations, and in stream bed sediments adjacent to the southwest corner of the site. Acidic drainage has developed due to the historic onsite coal stockpiling activities and has affected groundwater quality within the fill as well as within the shallow underlying bedrock. PAH and BTEX compounds were elevated in both the fill and bedrock groundwater, particularly at one locale near the western portion of the site where a major pocket of coal tar DNAPL was identified. Area 3 was the location of the Coke Batteries and By Products Building. Both soils and groundwater in this area are impacted with high concentrations of TPH / BTEX, PAHs, and to a lesser extent metals. The areas most impacted are within fill materials and shallow groundwater. Specific concerns relate to a PAH and TPH / BTEX groundwater plume near the former by-products building and widespread coal tar impacts.

Area 4, the location of the Benzol Plant and Tanks contains soils and groundwater that are impacted by high concentrations of TPH / BTEX, PAHs, and to a lesser extent metals and inorganic parameters. The areas most impacted are within fill materials and shallow



**FIGURE 4
COKE OVENS SITE
RISK ASSESSMENT
AREAS**



0 100 200m

LEGEND:

- Remediation Site Boundary
- 1 Donitar Site
- 2 Benzol Plant and Tanks
- 3 Coal Pile Runway and Coke Storage Area
- 4 Coke Batteries and By-Products Building
- 5 Mullins Bank and Non-Point Source Areas

groundwater. Generally, there is a trend toward decreasing concentrations of contaminants with depth of groundwater. Contaminated groundwater from the Benzol Plant and Tanks Areas is expected to discharge into Coke Ovens Brook.

Area 5, including Mullins Bank, is adjacent to the Municipal Ash Industrial Disposal site (MAID), which is a source of groundwater contamination. A contaminant plume migrates in a westerly direction centered directly below Coke Ovens Brook. The plume is approximately 350 m wide and concentrated within the shallow bedrock at depths of around 5 m, but can extend to depths as great as 20 m.

Area 5 is not scheduled for remediation. STPA advised the Panel that in 1995 PAH, TPH, and BTEX sample results were within the then interim remediation criteria established by the Canadian Council of the Ministers of the Environment (CCME) for residential or parkland use. STPA's own assessment found limited impacts to soils and groundwater.

The EIS states that currently part of the plume from the MAID site is captured by two onsite leachate collection systems and diverted to the recently commissioned Battery Point Water Treatment Plant. STPA expects that the long-term collection of this leachate would have a positive effect on Coke Ovens groundwater quality.

4.2 THE COKE OVENS SITE – PROPOSED REMEDIATION

STPA is proposing to use three methodologies to remediate the Coke Ovens site:

- Destruction of organic contaminants by way of removal and incineration;
- Treatment of contaminated soils by way of landfarming; and

- Containment of contaminated soils in-place.

As with Tar Ponds remediation, activities are scheduled to commence in 2007 and be completed by 2014. Post-remediation activities (e.g. water treatment, monitoring, and maintenance) would continue during the subsequent 25 year period.

4.2.1 Removal and Incineration of Contaminants

STPA proposes the excavation of 25,000 tonnes of soils from the Tar Cell and 1,300 tonnes of sediment from selected areas in Coke Ovens Brook. Tar Cell materials, described by STPA as the worst contamination on the Coke Ovens site, would be excavated to a maximum depth of approximately 2 m below ground surface using heavy equipment. Due to the high concentration of volatile substances, and the proximity of residential properties, STPA would excavate, passively dewater, condition and blend the excavated materials from the Tar Cells within an enclosure. Coke Ovens Brook sediments would be excavated under open air conditions and transported to the Tar Cells enclosure for conditioning and blending. Air flow within the enclosure would be controlled and filtered to remove contaminants prior to release. As with the excavated Tar Ponds sediments, blending materials would initially be coal fly ash followed by bottom ash from the Project's incinerator when it becomes operational. The blended materials would be loaded on rail cars and transported to the incinerator site.

4.2.2 Treatment of Contaminated Soils

Landfarming would involve the physical manipulation of Coke Ovens site surface soils together with moisture control and the addition of nutrients. It is considered a bioremediation technique as the manipulation and soil

amendments would enhance biodegradation of organic contaminants. In addition to the biological degradation of contaminants volatilization of lighter hydrocarbons and UV degradation of contaminants would also be enhanced.

Over a three-year period STPA would landfarm three separate areas of the Coke Ovens site, each for one season. The areas would be prepared by removal of debris and surface and sub-surface obstacles, removal of vegetation, grading and construction of berms to control surface water, and measures to collect, store and treat leachate and runoff. Soils would be pre-conditioned (i.e. blended and addition of amendments) prior to landfarming. Although the EIS indicates enclosures and vapour controls may be necessary at landfarming locations, STPA subsequently advised the Panel that only Tar Cell activities would require the use of an enclosure. Following the completion of landfarming, each of the three areas would be capped.

The extent and locations of soils to be landfarmed have not been precisely identified. Onsite debris and obstacles would constrain landfarming activities and consequently, although all areas to be landfarmed would be capped, not all areas to be capped would be landfarmed.

The Panel and others questioned the goals for landfarming on the Coke Ovens site. STPA has indicated that the remedial goal for bioremediation of shallow soil at the Coke Ovens is to meet SSTLs for PAHs and benzene, and that, if successful, it would reduce the concentration of light hydrocarbons in soil by 90%.

However, the large quantity of construction debris and rubble, concrete foundations and underground infrastructure represent a substantial impediment to tilling,

and would have to be removed, which could be more difficult than assumed.

STPA explained to the Panel that the success of remediation was independent of the performance of landfarming and that the removal of the landfarming component would not meet the Project aim of treating contaminated material. At the hearings STPA spoke of the need for redundancies in the design of remediation projects in order to provide an added level of security.

4.2.3 Containment of Contaminants

Containment, the primary means of addressing residual contaminants at the Coke Ovens site, would be accomplished by capping a portion of the site and by controlling surface and groundwater flows.

Surface Water Control

The EIS indicated that three small tributaries to Coke Ovens Brook would be relocated to minimize overall water treatment requirements facilitate access to specific areas requiring remediation, mitigate potential impacts to receiving water bodies and exposures to onsite and offsite receptors, and prevent recontamination of the remediated areas.

During excavation of materials from Coke Oven Brook, areas would be isolated by temporary dams constructed of steel sheet piling, earthen, or manmade materials. Water in Coke Ovens Brook would be pumped around excavation areas to allow work to continue.

Groundwater Control

STPA would intercept groundwater along portions of the site's north and south boundaries. This would reduce the potential for clean groundwater to contact contaminated materials and also the existing offsite flow of

contaminated groundwater and mobile coal tars. Interception of groundwater west of the site would prevent the movement of contaminants to the SYSCO site. In the area of the Coke Ovens Brook Connector, groundwater would be intercepted on both sides of the brook, thus preventing the re-contamination of the watercourse.

Vertical barrier walls would be used north and south of the Coke Ovens site, with a design permeability of 1×10^{-6} cm/s. The walls would consist of a bentonite / soil slurry placed in a trench. This method is easy to construct and should last indefinitely.

In the EIS STPA did not identify groundwater collection and treatment as a component of the remediation plan. However STPA has identified that it may be necessary to manage dissolved phase contamination in groundwater, collect both contaminated groundwater and mobile coal tar, capture and treat coal tar found below sections of Coke Ovens Brook and below the tributary to Coke Ovens Brook located in Area 1 of the site, and collect leachate originating from the MAID site.

Initially, STPA expected the groundwater collection and treatment system to include a combination of wells and interceptor trenches, and indicated that the remediation approach with its built-in redundancies might eliminate the need for long-term groundwater collection and treatment requirements. STPA subsequently provided the Panel with more detailed and definitive information. The Domtar (Area 1) interceptor wall (west of the site) would capture groundwater flowing west from the Domtar area. The wall would be set to the base of the overburden unit or to competent bedrock, and would be fitted with a bottom perforated pipe in bedding sand. The upper portion of the wall would be completed with a clay cap to minimize surface infiltration.

The groundwater captured by this wall (west of the site) would lower the water table on both the Coke Ovens Site and the SYSCO site, and prevent groundwater from flowing off the Coke Ovens Site in overburden. The wall would also decrease the flow of shallow bedrock groundwater onto the SYSCO site, even though it is installed in the till.

An interceptor trench would be installed at the bank of Coke Oven Brook to collect discharging groundwater. The trench would be installed in the base of the till unit (if present) or immediately above the shallow bedrock. Water would be collected in a sump structure on the west side of the site. The surface layer would be integrated with the Coke Ovens surface cap, in order to isolate surface water as much as possible from the interceptor trench, and includes the placement of an HDPE liner on a sand bed with gravel / cobblestone backfill. At approximately 50 m spacing, sump points or catch basins would be installed to manage sediment build-up, to allow for sampling of collected water and to assess the necessity of treatment. If the water collected is deemed to be of acceptable quality, it could be discharged directly to the Brook without treatment.

STPA has stated that the treatment of groundwater collected onsite would continue for 25 years at which time the requirement for treatment would be reviewed. STPA has not provided an estimate of the total volume or rate of groundwater capture and / or treatment during the 25-year period.

4.2.4 Capping

The purpose of the proposed cap at the Coke Ovens site is to reduce surface water infiltration and to contain contaminants. The area to be capped has not been finalized, but STPA has stated that Site-Specific Target Levels would set the criteria for necessary

increases or decreases to the extent of the capping on the Coke Ovens site.

The cap would consist of two layers – a minimum of 0.3 m of clayey / till material overlain by a topsoil layer with a minimum thickness of 0.2 m. The final thickness of the cap would be evaluated during subsequent design phases of the Project. It is expected to be variable and would depend on the final site grade. Following placement of the cap the site would be graded and hydroseeded.

4.2.5 The “No Incineration” Option

The Panel was advised that the “full containment, no incineration” option would result in the following changes to the activities described above: the 25,000 tonnes of Tar Cell materials would be solidified and stabilized in the area of the Tar Cell together with the 1,300 tonnes of materials excavated from selected areas in Coke Ovens Brook.

STPA has identified performance criteria for the solidified / stabilized materials as an unconfined compressive strength of 0.12 MPa (17 psi) or greater; a permeability of greater than 1×10^{-7} cm/sec; and conformity with a standardized leachate test. STPA conducted laboratory testing on samples of Tar Cell materials mixed with predetermined volumes of various additives – slag, fly ash, cement, and quicklime. Further testing of the Tar Cell material is required to determine an appropriate additive blend.

STPA has not clearly indicated if the Tar Cell materials are to be solidified / stabilized in-situ or ex-situ. A drawing presented to the Panel during the hearings depicted the solidified / stabilized materials fully contained within an engineered structure. STPA subsequently suggested that the Tar Cell materials would be excavated prior to solidification / stabilization.

The cap over the Tar Cell would have three layers: 0.5 m of soil, 0.5 metres of clay, and approximately 1 m of fill.

4.2.6 Ancillary Activities

The EIS states that prior to commencing remediation activities the Coke Ovens site would be cleared and graded to the extent required and the site infrastructure constructed. Requirements would be similar to those of the Tar Ponds site.

In response to the Panel’s request for more detailed information on the volume of resource materials required for remediation activities STPA advised that the Project would require 18,500 tonnes of sand, 125,500 tonnes of coarse stone, 115,000 tonnes of rip-rap, a combined 66,000 m³ of incinerator ash and coal fly ash, 49,200 tonnes of granular fill, 376,500 m³ clayey till material, 78,140 tonnes of cement, 35,912 tonnes of slag, 16,700 tonnes of fill, 8,300 tonnes of clay till, and 88,050 m³ of top soil. Sources of this material would be determined during the design stage.

4.2.7 Wastewater Treatment

STPA would treat water and wastewater from both the Tar Ponds and the Coke Ovens site as part of the remediation. Treatment of contaminated groundwater at the Coke Ovens site would likely be a long-term requirement. STPA would decide on the number of treatment facilities required, their location and their design, when finalizing the design of the Project. STPA has committed to release an effluent only after receiving acceptable analytical results. If treatment processes have demonstrated their reliability, direct discharge to receiving waters may take place. STPA has indicated to the Panel that, in addition to discharging directly to the environment, wastewater discharge to the municipal wastewater system is an option.

Waste Disposal

STPA has indicated that most wastes generated by the Project would be non-hazardous (e.g. site debris, concrete, piping, etc.), which would be disposed of in a non-hazardous waste engineered landfill on the Coke Ovens site. There is potential for small quantities of hazardous waste to be generated from incinerator fly ash, and if that material can be successfully treated onsite, it may be disposed of on the Coke Ovens site.

As stated in Chapter 5 the predicted total volume of bottom ash to be generated by the incinerator would be 66,000 tonnes. STPA proposes that this material be returned to the Tar Ponds where it would be treated by way of solidification / stabilization and contained within the Tar Ponds in the same fashion as the solidified / stabilized sediments.

Upon completion of remedial activities equipment, facilities and hazardous materials would be removed. The water treatment collection system and treatment plant would continue to operate. Over the following 25 years STPA would conduct environmental monitoring and site maintenance.

Long-Term Monitoring and Maintenance

A long-term monitoring and maintenance plan would be developed for the Tar Ponds site and would include all facilities, engineered structures, containment structures, and contaminant exposure control systems that require long-term operation subsequent to the completion of their remediation activities. The primary objective of the monitoring and maintenance plan would be to ensure their effective operation and long-term integrity in terms of their desired goals and objectives. In addition to the structures and containment systems monitoring, sampling of air, surface water, sediment, groundwater, and biota would also be carried out on a periodic basis. Such

monitoring programs would serve to provide verification of the effectiveness of the containment structures and contaminant exposure control systems as well as to permit the detection of any system failures. The duration of the monitoring would be determined in association with the regulatory authorities.

4.3 THE TAR PONDS – EXISTING CONDITIONS

The Sydney Tar Ponds were originally an estuarine area connecting the watersheds of Coke Ovens Brook and Wash Brook with the South Arm of Sydney Harbour. Wash Brook watershed has an area of 12.2 km², drains an urbanized portion of Sydney and, according to the EIS, has no contaminant sources other than urban runoff. Coke Ovens Brook drains an urban and industrial area of approximately 8.4 km².

Partially destroyed through infilling along its western shoreline, and severely degraded by pollution, the Tar Ponds now consist of two water bodies – South and North Ponds. The South Pond has an area of 13 hectares and contains an estimated 350,000 tonnes (in-place) of contaminated sediments. Pond waters are primarily fresh and are controlled by an earthen dam and control structure which limit tidal influences of the harbour. The dam, located at the end of Sydney's Ferry Street, separates South and North Ponds.

The North Pond has an area of approximately 19 hectares and contains an estimated 360,000 tonnes (in-place) of contaminated sediments. The pond is currently open to the harbour and remains an estuarine area. The two ponds are shown in Figure 5.

Wastes from 100 years of steelmaking, coke production, and other industrial processes have contaminated the water and sediments of

the Tar Ponds. The condition of the ponds was worsened by the discharge of raw sewage and by the influence of leachate from up-gradient municipal and industrial solid waste disposal operations. The EIS estimates 47 outfalls discharged an average of 13 million litres per day of combined sewage and storm water.

Over the past twenty years direct discharges of contaminants to the Tar Ponds and upstream water courses have ended or have been controlled. Coking operations were shut down in 1988; the adjacent SYSCO steel plant was closed in 1999; the solid waste disposal sites have been closed and are undergoing remediation; and, excepting periods of overflow, sewage discharges have been diverted to a recently construction treatment plant. Despite the removal or control of pollution sources the Tar Ponds remain grossly contaminated and pose a risk to human health and the environment.

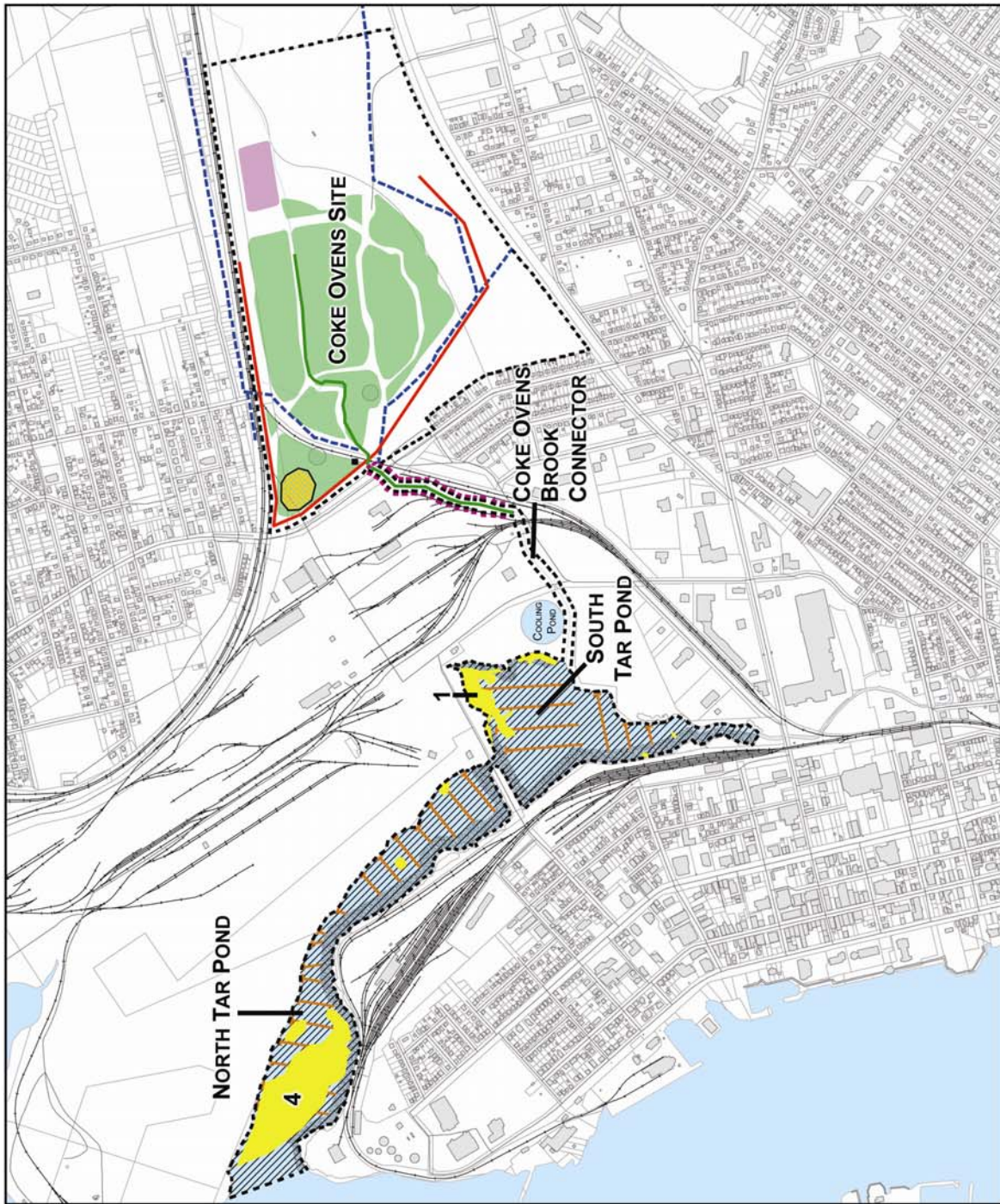
The heterogeneous Tar Ponds sediments consist of a layer of contaminated granular and fine sediments with an average depth of 1.7 m overlying clayey silts and or till. The sediments include visible coal tar and large proportions of coal and coke. The moisture content and total organic carbon content of the sediments have not been fully characterized. One of STPA's reports provides a moisture content of 63 per cent (Public Registry Document CRA-11). However, at the hearings STPA described moisture content in the range of 15 to 50 per cent. The values for total organic carbon content provided during the hearings were 24 per cent and 68 per cent in two areas of the South Pond and 13 per cent and 20 per cent in two areas of the North Pond. The high organic carbon content of the sediments provides a bulk heating value for the sediments of 9,860 kJ/kg, comparable to sub-bituminous coal.

The primary contaminants in the Tar Ponds are polycyclic aromatic hydrocarbons or

PAHs. Of secondary importance are PCBs, other organic compounds, and metals. The contaminant distribution within the ponds sediments is erratic. PAHs are found at elevated levels throughout the ponds. Concentrations range from 880 to 27,800 mg/kg. PCB concentrations in the sediments range from below detection values to 2,600 mg/kg. Although PCBs are distributed throughout the ponds, eight "hotspots" have been identified (See Figure 5). The hotspots are based on the internationally accepted criterion of a PCB concentration of greater than 50 mg/kg. STPA has identified 48,000 tonnes (wet weight) of sediment that contain PCBs at concentrations greater than 50 mg/kg. While highly contaminated, the mobility of the organic contaminants is reduced by their hydrophobic nature and binding to fine organic particles.

The EIS describes the geological stratigraphy of the Tar Ponds as fluvial estuarine sediment overlying glacial till which in turn overlies Canso bedrock (mudstone). The Tar Ponds are a groundwater discharge area. Groundwater flow is controlled by hydrostratigraphic units including Canso HU, Till HU, Fluvial Estuarine HU and Fill HU. The Fill HU, highly variable, includes the slag that in fills the SYSCO area to the west of the ponds. The EIS reports an average hydraulic conductivity for the infill area known as the High Dump as 3.3×10^{-2} cm/s and suggests a maximum of 10^{-1} cm/sec or higher. Groundwater flow is also influenced by tidal fluctuations within the Tar Ponds. The reach of the unobstructed tide extends past the upstream limits of South Pond.

A contaminant loading study was completed by JDAC which evaluated contaminant mass loading contributions from groundwater and surface water sources to the Tar Ponds. A portion of the contaminant loading results from substances in groundwater



**FIGURE 5
TAR PONDS,
COKE OVENS,
AND REMEDIAL
ACTIVITIES**



0 200 400m

LEGEND:

- ++ Active railroads
- Road
- Watercourse
- - - Remediation Site Boundary
- Proposed water treatment plant
- - - Cut-off walls
- Coke Ovens Brook cleanup
- - - Proposed re-routing of Coke Ovens Brook
- Diversion Walls
- Cap Drains
- Areas to be landfarmed and capped
- ▨ Area to be stabilized, solidified and capped
- ▨ Proposed landfill location
- ▨ Inground tar cell to be excavated and incinerated
- ▨ PCB Hotspots
- ▨ Channelization of Wash Brook and Coke Ovens Brook Connector

discharging directly into the North and South Ponds. Estimates were determined by means of the JDAC groundwater model and by utilizing average groundwater concentrations of contaminants reported in the vicinity of the ponds. The 2002 groundwater model was modified to produce more conservative discharge data that accounted for annual seasonal variation in flows. The total estimated groundwater loadings to the ponds were greater than 200 kg/year for copper and zinc and less than 20 kg/year for other metals. The estimated loading of mid-range hydrocarbons (C10-32) was greater than 1000 kg/year. For low molecular weight PAHs, total loading was greater than 200 kg/year with naphthalene alone accounting for 79% of this mass. Medium and high molecular weight PAHs accounted for <20 kg/year.

4.4 THE TAR PONDS – PROPOSED REMEDIATION

Remediation activities are scheduled to commence in 2007 and be completed by 2014. Post-remediation activities (e.g. monitoring and maintenance) would continue during the subsequent 25 year period.

STPA presented to the Panel a remediation Project that had not reached the completion of its pre-design phase. Consequently, the Panel found the EIS did not provide sufficient detail on many aspects of the remediation Project. The pre-design continued in parallel with the environmental assessment and STPA presented additional Project detail as the assessment continued. The remediation activities described below are based on the Panel's understanding of the Project as contemplated at the time of the assessment. The Panel recognizes that as the design progresses details of the Project would be modified and further developed.

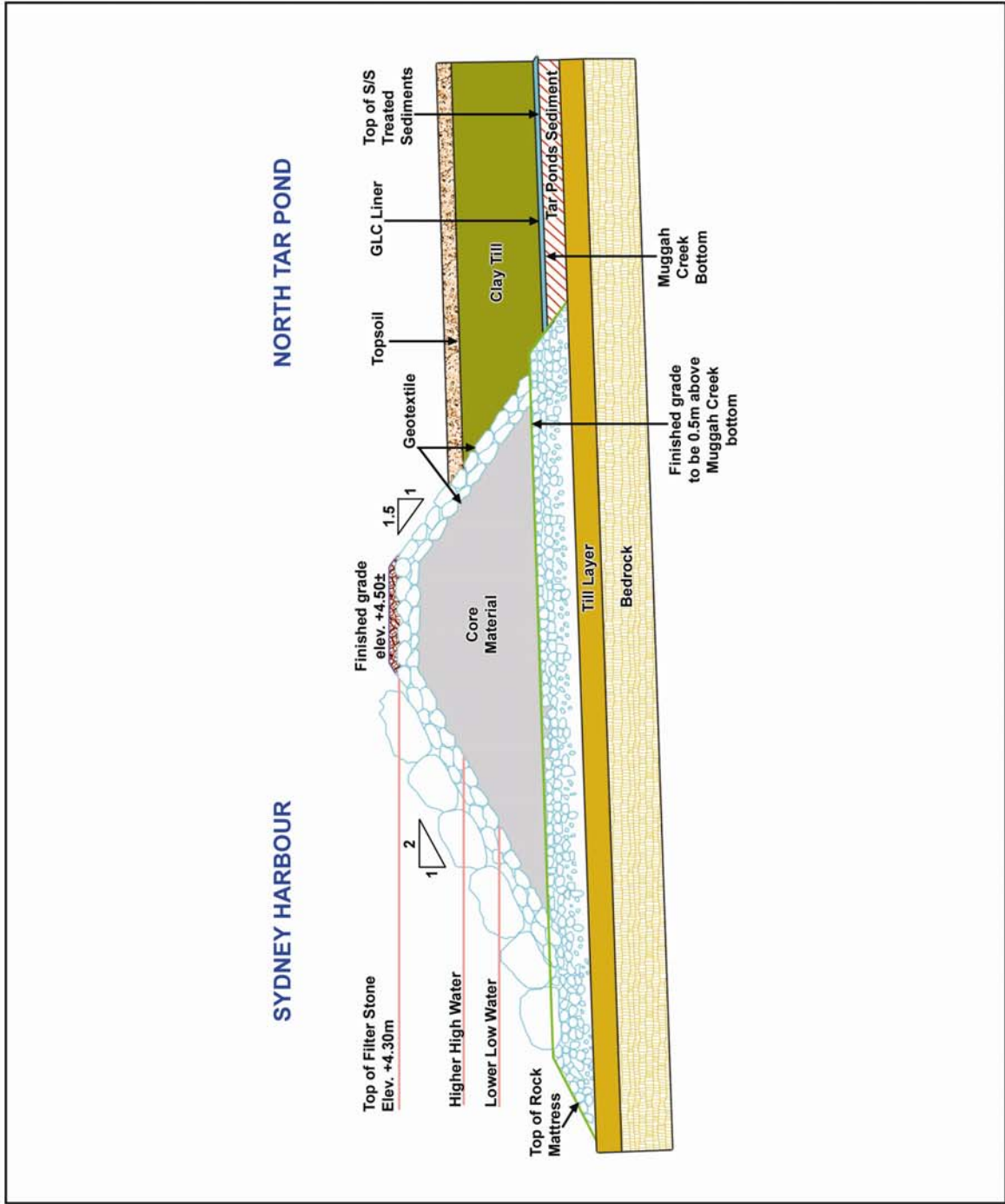
4.4.1 Preventative Works

STPA has defined preventative works as “Projects initiated to reduce contaminant migration to Sydney Harbour, improve existing infrastructure and facilitate the proposed remediation of the Tar Ponds and Coke Ovens sites.” These works have been or would be carried out in advance of site remediation and are not within the scope of the Project subject to assessment. One of the preventative works is to take place within the Tar Ponds.

A barrier dam would be constructed at Battery Point for the purpose of controlling movement of contaminated sediments from North Pond into Sydney Harbour. The barrier would protect the existing sediments and the remediated sediments from ice forces, wave energy, storm surges, and future sea level rise. STPA has recognized that additional measures would be required during remediation activities to minimize sediment loss. While the EIS stated that the dam was to be impervious, STPA later responded to public comments with notice that impermeability was no longer one of the design criteria. During the hearings STPA provided the Panel with a design drawing for the structure (Figure 6) and advised that construction would be complete by fall 2006.

Rip-rap or other armouring would be used as needed to manage erosion from waves, storm surges, or floods. Armouring would be provided along the waterway channels in Muggah Creek as needed to prevent erosion. It is expected that vegetation alone would likely prevent erosion over most of the area of the capped Tar Ponds.

Rigorous construction quality assurance and quality control procedures would be developed during the design process and would be implemented during construction. In addition, a monitoring plan to confirm the performance would be developed.



**FIGURE 6
CROSS-SECTION
OF A TYPICAL
BARRIER AND
RESTORED NORTH
TAR POND**

Construction quality assurance and quality control procedures would be developed during the design process and would be implemented during construction. In addition, a monitoring plan to confirm the performance would be developed.

4.4.2 Surface Water Control

STPA indicates in its EIS that one of the first Tar Ponds remedial activities would be to isolate the flow of water from Coke Ovens Brook and Wash Brook away from the contaminated sediments. A constructed channel would carry the surface waters from the upper end of South Pond primarily along the western side of the ponds to the Battery Point dam where it would discharge unimpeded through a 50 metre wide opening to the harbour. The walls along the contaminated sediment side of the channel would be constructed using steel sheet piling. After the sheet piling installation, a 25 m channel would be excavated; the excavated sediments would be relocated to other areas of the ponds for treatment and containment. Where the new channel intersects “PCB contaminated areas” the sediments would be isolated for later removal and destruction. The Panel interprets this to mean where the channel intersects PCB hotspots 1 and 4 only. As the depths of the contaminated sediments to be removed vary, so too would the depth of the channel.

The bed of the channel would consist of a bedding layer of sand, a HDPE liner, and a surface layer of crushed rock. Similarly, the walls along the contaminated sediment side would be constructed of rock fill / rip-rap and HDPE liners. Nearing completion of remediation activities, the sheet piling would be cut off below low water. The surface of both banks of the finished channel would be rip-rap stone. (IR-37 Response)

In responding to the Panel’s request for more detailed information on the design of the

channel (IR-32 Response), STPA provided details for the channel which were developed as part of the design work for the Battery Point barrier dam. Modelling of water flows, based on a 25 m channel and the 1 in 100 year peak flow event, predicts the overall effect of the channel, the Battery Point barrier, and the removal of the Ferry Street dam on water elevation within the channel would be a lower water level upstream of Ferry Street and a higher water level downstream of Ferry Street. As a result, STPA predicts a decreased risk of flooding in the community. Due to the removal of the Ferry Street dam, the current speeds in the proposed channel system would be dampened as compared to existing conditions. The predicted range of velocities is approximately 0.6 m/s to 1.0 m/s. STPA predicts that all areas of the channel in the Tar Ponds, and a portion of Wash Brook, would remain influenced by tides and that the channel would provide for fish passage.

4.4.3 Removal of Contaminants

STPA is proposing to excavate the two largest PCB hotspots – Area 1 in South Pond and Area 4 in North Pond. STPA estimates the mass of Tar Ponds sediment identified for removal at 10,000 tonnes (wet weight) in South Pond and 42,539 tonnes (wet weight) in North Pond. The removal of the hotspot materials, particularly in the North Pond where much of the target area is located in subsurface sediments, would require mixing of targeted materials with overlying and adjacent sediments. Consequently, the total mass of sediments to be removed is expected to be 120,000 tonnes. The 120,000 tonne figure, used throughout EIS, is in fact 120,000 tonnes wet weight. Using the estimate of water content for Tar Ponds sediment provided in a 1996 report – 63% – the dry weight of the sediments to be removed could be as low as 44,400 tonnes.

To minimise sediment loss, sediment excavation would take place under relatively dry

conditions. Steel sheet piling, extending into the till or toe-pinned to bedrock, would be installed around excavation areas. The Panel requested STPA provide additional information on the handling and processing of excavated Tar Ponds materials. The water from the isolated excavation areas would be pumped to a steel sheet piled containment area to allow settling of suspended materials prior to pumping or decanting. Debris removal and excavation of sediment would be carried out concurrently. Excavated sediment would be transported by truck to the northeast corner of South Pond (the Material Conditioning Area) in watertight containers. To improve handling and reduce heterogeneity sediment would be dewatered passively; mixed; and blended, first with coal fly ash and then, when it becomes available, bottom ash from the incinerator. Conditioned sediments would be covered and stored prior to transfer by way of rail to the incinerator site. STPA initially advised the Panel that the material would be loaded into containers prior to transport. During the hearings STPA indicated that the material would be contained in covered and water tight rail cars.

As part of the development of the remediation Project, STPA and Environment Canada proposed the remediation of the Tar Ponds include the removal and destruction of “PCB contaminated sediments” (i.e. sediments with a PCB concentration greater than 50 mg/kg). The Project reflects this proposal with the two largest “hotspots” identified for sediment removal and incineration. STPA has explained to the Panel that the remaining hotspot sediments would remain due to cost considerations, the practicalities involved with excavating and processing several small volume hotspots, and the incremental gain to be realized.

Although STPA is targeting PCBs in the Tar Ponds for removal and incineration the EIS did clearly describe the mass of PCBs found

within the Tar Ponds, the mass of PCBs to be destroyed, or the distribution of the PCBs within the ponds. In response to written questions STPA informed the Panel that a 1996 report provided the most thorough assessment of PCB contaminated sediments and that it was its primary reference for discussion of PCB contaminated sediments. The 1996 report found seven areas where sediments were estimated to be contaminated with PCBs at concentrations greater than 50 mg/kg (Figure 5).

During the hearing the Panel requested additional information from STPA on the mass of PCBs in the non-hotspot areas of the Tar Ponds. STPA responded with estimates of the total mass of PCBs in the North and South Ponds, between 7.4 and 8.4 tonnes; the total mass of PCB in the hotspots, 3.7 tonnes; and the mass of PCBs targeted for removal from both ponds, 3.3 tonnes. Using these figures 89% of PCBs found in hotspots areas are targeted for removal and incineration is 89. Between 39% and 45% of the total mass of PCBs found in the ponds is proposed for removal and incineration.

4.4.4 Solidification and Stabilization

The STPA proposal would ensure that the remaining contaminants within both the North and South ponds are bound in a cement matrix. The material within the ponds would be mixed with a defined quantity of cement and slag material which is expected to provide a base cover of 17 to 20 psi (0.12 to 0.14 MPa) once the material has solidified. STPA indicated that the geotechnical criteria for the solidification / stabilization treated sediments were based on industry standards of 17 to 20 psi (0.12 to 0.14 MPa) for unconfined compressive strength (UCS), and, in addition, as one of the goals of the solidification / stabilization treatment process is to minimize groundwater flow through the contaminants (so as to minimize the migration of contaminants), the hydraulic conductivity 1×10^{-7} cm/s.

4.4.5 Containment of Contaminants

Containment, the primary means of addressing residual contaminants in the Tar Ponds would be accomplished by capping the site and by controlling surface and groundwater flows.

Residual contaminants at the Tar Ponds site would be isolated using a containment system designed to reduce the possibility of human and ecological exposure to the contaminants as well as to prevent the movement of the contaminants offsite. In-place containment would involve the construction and placement of barriers that block the pathway between the contaminant source and the receptor. The barriers would be designed to remain in-place permanently. An engineered surface cap (see Section 3.2.4.1) would be placed over the Tar Ponds following the removal of the PCB sediments and solidifying and stabilizing the upper 1 to 2 m of the remaining sediments. Low permeability vertical containment walls would be constructed along the shoreline of the Tar Ponds to prevent offsite groundwater from flowing onto the site and potentially contacting contained contaminants.

The cap on the Tar Ponds site would be designed to limit the migration of contaminants upwards to the environment and potential receivers and to limit the infiltration of precipitation through the cap. The cap would also be designed to limit the potential for plant roots, burrowing animals, etc. to physically penetrate the cap. STPA has indicated a one metre (average) and a 0.3 metre (minimum) thickness for the clay liner. As well, the clay would constitute the main impervious layer for the capping and would have a hydraulic conductivity of 10^{-6} cm/sec. The clay layer would likely be constructed using a combination of geotextiles, clay, and granular fill.

A second lift of granular fill would be placed to provide additional protection and ensure confinement of the sediments. The granular layer would include a network of drainage pipe which would serve to collect and transport the groundwater from under the monolith. The cap surface would be protected from erosion by the cofferdam at Battery Point.

The monolith would be subjected to the required leachate test prior to the final engineering design.

4.4.6 Groundwater Control

Management of surface waters at the Tar Ponds and Coke Ovens sites is interrelated with groundwater management. Additionally, the Project is not intended to directly target groundwater for remediation, but rather to mitigate the generation and discharge of contaminated groundwater and surface water from the Project area, relying primarily on the use of engineered control measures

As discussed throughout the EIS, an extensive network of engineered controls is proposed and consists of a (currently unspecified) configuration of: vertical barrier walls, diversion trenches, interceptor trenches, infiltration galleries, French drains, pump and treat systems and surface caps would be engineered for the Tar Ponds.

In response to the Panel's request to describe Project components, STPA updated EIS information provided on the network of trenches to be constructed as part of Tar Ponds remediation. Following solidification the trenches would be excavated through the solidification / stabilization treated sediments and 1.0 m into the underlying till unit. The trenches, with a nominal width of 1 m, would extend through the sediments and 1.0 m into the underlying till. Following excavation they would be backfilled with granular fill, up to the

top of the solidified sediments. A HDPE liner would be placed between the granular trench backfill and the solidified sediments. A geosynthetic clay liner (GCL) would then be placed directly on the final grade of the solidified sediments. Figure 5 illustrates the array of trenches. Figure 7 illustrates design details.

The trenches are designed to reduce hydraulic pressure by promoting entry of groundwater from below, and shallow groundwater from along the western shoreline. The entry of both shallow and deep groundwater into the trenches is intended to minimize groundwater contact with the solidified Tar Ponds sediment. The purpose of the HDPE liner is to isolate the solidified sediments from infiltrating precipitation. The site would be contoured to promote runoff.

Sampling wells would be installed near the channel end of each trench, to allow recovery of groundwater samples in the post-construction period. If unacceptable levels of groundwater contamination are detected, collection and treatment of the groundwater may be required. STPA has advised that it expects that groundwater in the trenches would not contain unacceptable concentrations of contaminants.

4.4.7 Vertical Cut-Off Wall Installation

Vertical cut-off walls would be used along the shoreline of the Tar Ponds site to control the movement of clean and contaminated groundwater and contaminants. The vertical cut-off walls may be constructed of materials such as Sheet pile and would be driven from the surface to hard till. Alternatively, depending on depth, the sheet pile can be placed in an excavated trench and backfilled. The sheet pile and clean backfill would be imported to the site. Cut-off walls would typically be excavated, mixed and backfilled with bentonite or cement.

A geomembrane or a geosynthetic clay liner could also be used as a vertical cut-off wall. In this case, an open trench would be excavated, the geomembrane or geosynthetic clay liner would be placed along the wall of the trench and the trench would be backfilled.

4.4.8 “Full Containment, No Incineration” Option

The “full containment, no incineration” option would eliminate all activities associated with the excavation of PCB hotspots. The additional 120,000 tonnes of sediments in these areas would be solidified and stabilized in-place. Without incineration there would also be no need to return incinerator bottom ash to the Tar Ponds for solidifying / stabilizing.

4.5 AIR QUALITY AND HUMAN HEALTH

4.5.1 STPA Assessment

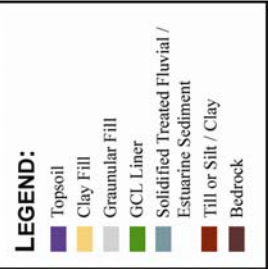
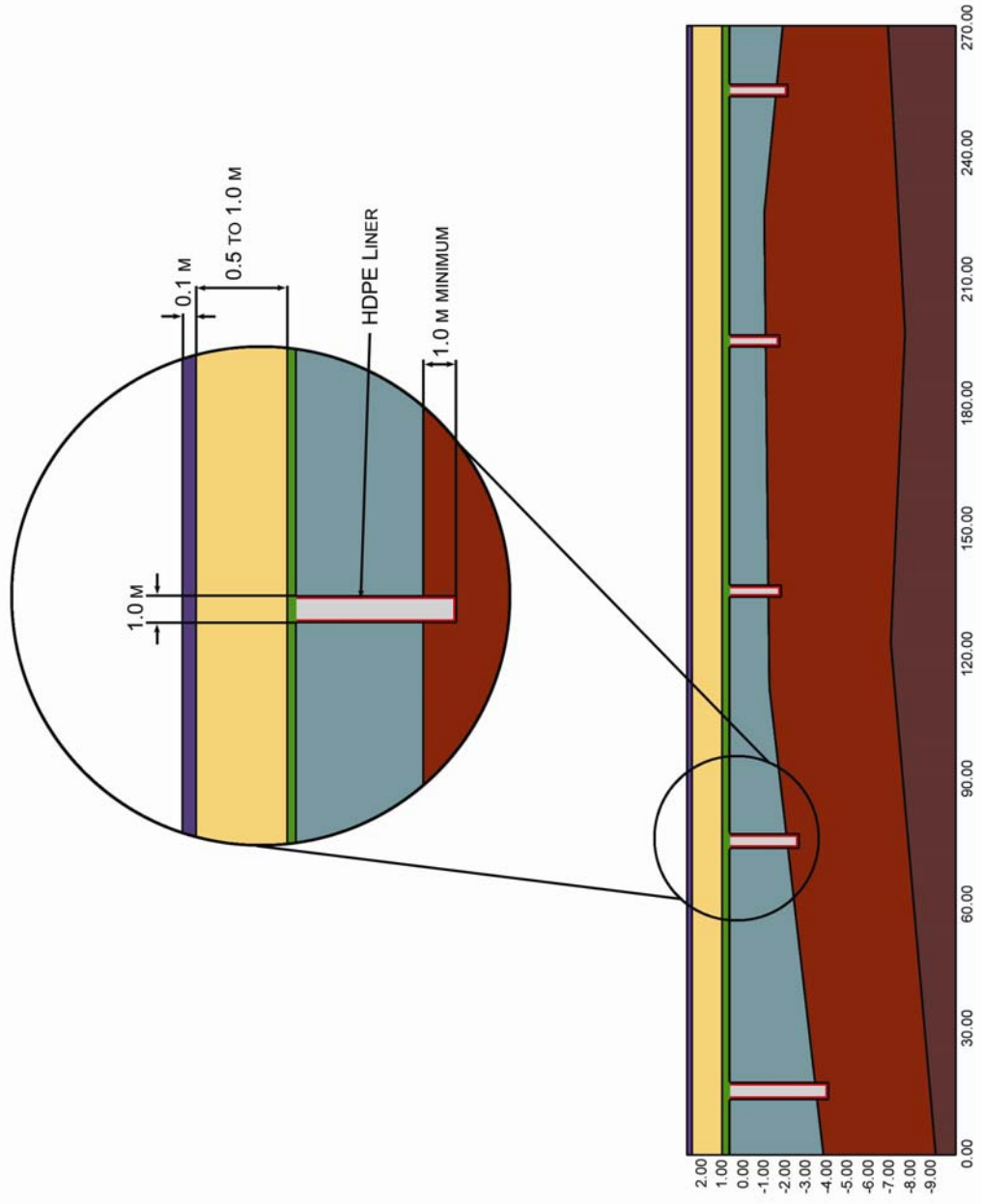
In 2001 governments developed an ambient air monitoring program (AAMP) to collect baseline data of air quality in areas adjacent to the Tar Ponds and Coke Ovens site. The program was upgraded in 2004 and it currently consists of six urban stations, five of which are in close proximity to the sites and the sixth, 3.5 km upwind. The monitoring program measures specific contaminants identified on the Tar Ponds and Coke Ovens site. It does not include other commonly measured indicators of air quality such as sulphur dioxide, nitrous oxides, and ozone. Contaminants monitored are not specific to the Tar Ponds and Coke Ovens site and are typically released from other common sources in an urban environment.

STPA compared data collected from the monitoring program in 2002 and 2003 with annual data from other Canadian air quality monitoring locations, and concluded that the annual averages of the parameters measured in Sydney appear to fall within the values

**FIGURE 7
TAR PONDS CAP
CROSS SECTION**

SCALE:

Horizontal = 1:1000
Vertical = 1:200



demonstrated at other urban Canadian stations. STPA described air quality in the Project area as very good compared to major cities in Canada.

The Panel, interested in how air quality data conforms to short-term exposure criteria, requested additional data on 1-hour and / or 24-hour criteria. STPA provided additional information demonstrating that background air quality has exceeded 24-hour criteria for the PAH compound benzo[a]pyrene and total suspended particulates on a few occasions. The EIS notes that the highest average total PAH levels were recorded at the Frederick Street location which is situated downwind of prevailing winds. The highest levels of two fractions of particulate matter were also found at this location.

To assist in predicting the effects of the Project on air quality, STPA conducted two pilot-scale simulated remediation activities involving Tar Ponds sediments – excavation and in-situ stabilization. Other emission estimates were based on models developed by the U.S. EPA (EIS, Volume 3). The modellers relied on existing sampling and meteorological data and, due to the early stage of the Project design, assumptions relating to the nature, scheduling, and rates of remedial activities. The results were then used in a Human Health Risk Assessment (HHRA). (EIS, Volume 5). The HHRA evaluated potential carcinogenic and non-carcinogenic risks to Project workers and to residents living near the sites. The health risks to residents were separated into evaluations for toddlers and for adults.

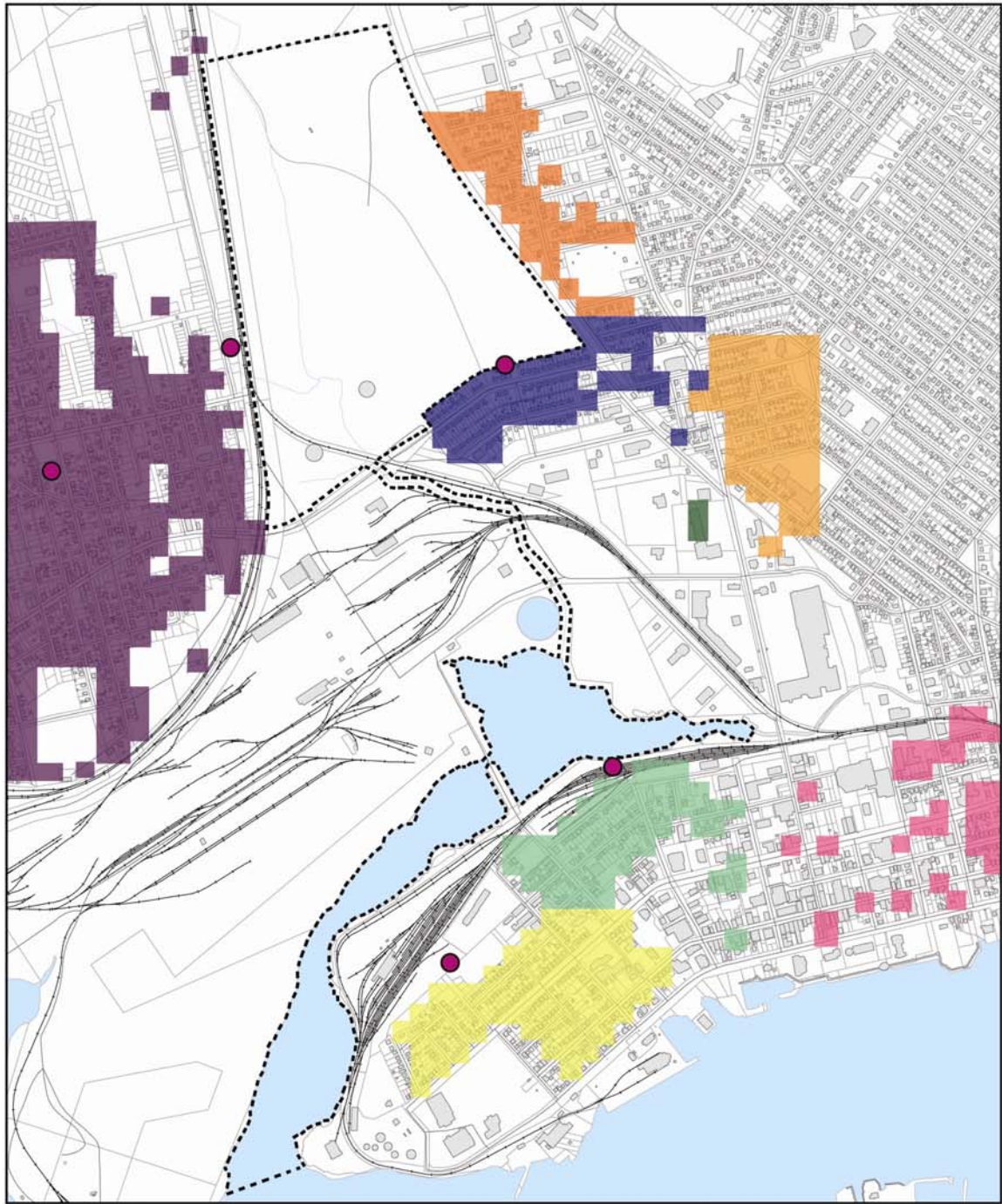
The air modeling examined the emissions from the various proposed remediation activities (e.g. sediment and soil excavation, landfarming, solidification / stabilization, surface capping and grading) and ancillary activities (e.g. material handling, onsite traffic, and vehicle and locomotive emissions). Model input data were collected

following identification of activities; types, sizes, and equipment numbers; and anticipated operating schedules. STPA also took into consideration the combined effects of simultaneous activities. The boundaries for the dispersion model extended approximately 1 km beyond the Tar Ponds and Coke Ovens remediation areas. Eight offsite residential areas and onsite work areas were identified. Figure 8 identifies the residential areas and the five air monitoring / receptor locations. And finally, maximum concentrations of the various air quality parameters for 1-hour, 8-hour, 24-hour, and annual averaging periods were predicted. The EIS states that these predictions essentially represent worst case scenarios.

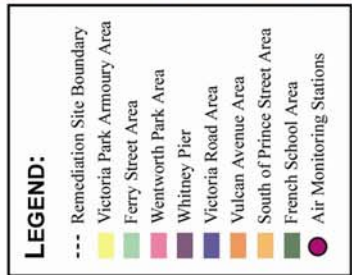
To determine significance of predicted changes in air quality the EIS relied on established federal and provincial (Nova Scotia and Ontario) criteria. It defined a significant adverse effect on air quality to include one that involves predictable, sustained or frequent (e.g., more than 10 times a year for 24 hr criteria) exceedances of any applicable regulatory criterion or objective.

STPA also identified a second set of less conservative air quality criteria for benzene, naphthalene, and methylnaphthalene at the request of the Medical Officer of Health. As to the use of those criteria, STPA informed the Panel at the hearings that these less conservative criteria would not be used and that air quality action criteria would be derived in consultation with the relevant agencies at a later stage of the Project.

For the purposes of dispersion modelling STPA assumed a 10 year span of active remediation. The modelling predicted a number of offsite exceedances of the Project's air criteria; however STPA concluded that the frequency was generally low, as were the magnitudes of the exceedances. Recognizing the Project's air quality significance criteria, STPA



**FIGURE 8
RESIDENTIAL
AREAS AND
AIR MONITORING
STATIONS**



determined that, with the implementation of mitigation measures, remedial activities at the Tar Ponds and Coke Ovens site would not likely result in significant adverse offsite air quality effects.

STPA recognized air quality as a key issue for the Project and in addition to the use of the Tar Cell enclosure identified a number of practical mitigation measures including covering materials, use of foam and dust suppressants, minimizing work faces, watering roads, implementing speed restrictions, and scheduling of activities.

STPA recognizes that remedial activities at the Tar Ponds and Coke Ovens site would potentially expose workers to harmful airborne substances. It also believes that occupational health and safety requirements, coupled with the Project's own requirements for safety plans, would provide appropriate mitigation.

STPA, comparing the entire Project's greenhouse gas emissions to regional, provincial and national emissions, concluded that the Project is not likely to generate high or medium volumes of emissions and that the Project is unlikely to disturb existing carbon sinks.

STPA identified odour as an air quality issue. The Panel identified odour as also being a community health and well-being issue and has addressed it in Section 8.5 of this report.

In its analysis of the environmental effects of the "full containment, no incineration" option STPA found that adverse effects potentially associated with a number of incineration related activities would be eliminated and that air emissions associated with the solidification / stabilization of the additional Tar Pond sediments and the new activities associated with the solidification / stabilization at the Tar Cell area would require additional analysis. STPA conducted the required analysis finding that the

change in air quality due to higher levels of volatilization of Tar Ponds contaminants would remain below significance thresholds and that, at the Coke Ovens site, the use of the previously identified enclosure, ventilation and air filter system would prevent harmful air emissions.

4.5.2 Government and Public Concerns

Many participants provided the Panel with their views on past air quality problems and related health effects and most spoke of the need for monitoring and, in particular, real-time monitoring. All seemed to agree that air issues were critical to a successful remediation Project.

Local residents told the Panel about their past experiences with air quality issues and monitoring, and were concerned with the potential for adverse health effects, the need for real-time data, and the reliability of the existing network of stationary monitors. The operating schedule of the stationary monitors, once every six days, was noted as a weakness. One individual sought assurance that activities other than those associated with the Tar Cell would be conducted within enclosures. Included in the activities of concern were Tar Ponds excavation, Tar Ponds solidification / stabilization, and landfarming on the Coke Ovens site. Problems in the recent past with monitoring on the Tar Ponds and Coke Ovens site were identified and questions on odour detection thresholds and their relationship to human health air quality criteria were discussed. The appropriateness of using risk-based criteria for substances with no known safe concentration was questioned as was selection of a suitable real-time criterion for particulate matter.

One participant advised the Panel of a US study that concluded that during solidification up to 90% of all volatile organic components may be released to the atmosphere. A second voiced concern with the lack of bench scale or field testing of Tar Ponds excavation,

handling, and solidification / stabilization activities.

Health Canada advised the Panel that air quality is the key issue for the remediation Project, and that it was generally comfortable with the mitigative measures outlined in the EIS. However, while the department supported the conclusions of the risk assessment, it noted that some predicted risks approached Project significant levels and there were some predicted short-term exceedances for contaminants in air in some residential areas (Whitney Pier, North End, and Victoria Road).

Health Canada recommended that the Panel require:

- All stated mitigation measures to be in-place;
- A detailed ambient air monitoring plan including monitoring of PM_{2.5} and PM₁₀ fractions of particulates;
- Set action levels with specific actions to be taken for any exceedances;
- Real-time monitoring in communities where the risk assessment indicated potential exceedances in air, PCB monitoring near Tar Ponds excavations to ensure volatilization of PCBs is not an issue; and
- Mandatory reporting of environmental effects such as real-time air quality exceedances to the provincial health authorities.

During the hearings the Panel requested Health Canada's opinion on STPA's proposed criterion for a significant adverse effect on air quality. They responded that the criterion was reasonable for the Project and that Health Canada would not consider one exceedance over a reference concentration to be significant. It reiterated its concern with expected exceedances in residential areas and the need for an effective air monitoring plan.

Both Health Canada and Environment Canada advised the Panel of their concerns with the air quality effects of remediation activities acting in a cumulative manner with those of the proposed incinerator. During the hearings STPA responded that, from a quantitative perspective, there is no overlap from an air emissions perspective between the remediation activities and incinerator operations. Environment Canada was not fully satisfied with the information provided and indicated it remained concerned with missing short-term exposure information. Environment Canada went on to explain that while there were information gaps to be filled, the department did not consider them as a significant issue. As part of its recommendation for a pilot in-situ study of the solidification / stabilization process, Environment Canada recommended that STPA further investigate the potential for airborne emissions and evaluate potential mitigation techniques. The department also provided its recommendation on an air monitoring and follow-up program.

NSEL advised the Panel that its recent monitoring of air quality in Sydney demonstrated that the air quality is generally good and criteria exceedances are not a concern. However, NSEL believes that air quality would be one of the biggest issues for the Project. Noting missing air quality parameters in the risk assessments, and predictions of periodically elevated parameters, the department advised on the need for plans to reduce emissions and exposures and for a detailed air monitoring plan that provides early warning of deteriorating air quality. NSEL stated that it would be looking for STPA to come up with innovative ways to get air quality information out into the community.

The representative of from the Medical Officer of Health's office spoke of the importance of using very stringent guidelines; dealing effectively with public concern by recognizing the true level of threat to a person's

health ; a data quality assurance program; and a communication plan. While not restricting his comments to air quality, the representative also spoke to the need for ongoing involvement of medical professionals; involvement of a representative stakeholder group; and transparent and credible processes.

4.5.3 Panel Conclusions and Recommendations

The Panel heard more concerns relating to air quality than relating to any other issue. While many of those concerns were associated with the incinerator, there were numerous others relating to both proposed and past remediation activities. The Panel acknowledges the past efforts of STPA to manage air quality issues effectively and supports STPA's intention to evaluate the existing monitoring network to determine its adequacy to assess impacts resulting from the proposed remedial work.

STPA, the public, and government agencies have all identified the importance of air monitoring. The Panel observes that there may sometimes be a challenge to achieve the right balance, between, for example, expectations for both real-time and high quality data; for stringent criteria but avoiding unnecessary alarm; the need to move ahead and the need for more evaluation. The Panel notes that, while an effective and practical monitoring is both necessary and achievable, all those participating in the future program must recognize the need for flexibility and cooperation.

The Panel has concluded that prior to final approvals for the remediation Project there is a need for additional information on predicted air quality. Given the acknowledged heterogeneity of the Tar Pond sediment and the limited scope of the August 2005 field program, the Panel believes further information is required on the relationship between

solidification / stabilization and air quality. Due to the history of background air quality exceedances in the Project area, predictions that air quality parameters would approach significance levels, the need for more short-term exposure predictions, and the early design phase of the Project, the Panel believes that additional data is required on expected ambient air concentrations. The Panel also has recommendations on the Project's air monitoring program.

Recommendation # 4

Combined Emissions and Expected Ambient Air Concentrations

The Panel recommends that NSEL and PWGSC require STPA to calculate the total expected ambient air concentrations due to the combination of all Project-related emission sources and the existing pollutant levels in the local air shed. The results of this analysis may affect the ecological and human health risk assessments. NSEL and PWGSC should require STPA to re-evaluate the risk assessments and incorporate the results into the Project design and applications for regulatory approvals, as appropriate.

Recommendation # 5

The Solidification / Stabilization Process and Air Emissions

The Panel recommends that NSEL and PWGSC require STPA, as part of a pilot in-situ study of the solidification / stabilization process (Recommendation 13), evaluate the potential for air-borne emissions and implement appropriate mitigation measures and integrate these measures within the Project design.

Recommendation # 6

Remediation and the Air Monitoring and Follow-Up Program

The Panel recommends that NSEL and PWGSC require STPA (with the appropriate involvement of Environment Canada, Health Canada, the Medical Officer of Health, the Cape Breton District Health Authority, and the Project Community Liaison Committee) to design an Air Monitoring and Follow-up Program for the Project. The program should be based on technically sound principles and procedures with special consideration given to:

- **Incorporating the results of the proposed evaluation of the existing monitoring network, including an evaluation of the causes of and responses to recent air quality incidents at the Tar Ponds and Coke Ovens sites;**
- **Development of conservative, unambiguous and practical air quality monitoring criteria;**
- **Appropriate responses to exceedances of air quality monitoring criteria;**
- **The need for real-time data, early warning and early reporting of deteriorating air quality;**
- **The need for a public communication plan providing results and, if required, an indication of effects on public health;**
- **Monitoring of the PM2.5 and PM10 fractions of particulates;**
- **PCB monitoring near Tar Ponds excavations;**
- **Reporting real-time air quality exceedances at the perimeter of the sites or off-site to the Medical Officer of Health; and**
- **Periodically reporting back to the NSEL and PWGSC on the accuracy of**

the air quality predictions and the effectiveness of any measures taken to mitigate adverse air quality effects.

4.6 GROUNDWATER AND SURFACE WATER QUALITY

4.6.1 STPA Assessment

STPA is proposing to address groundwater remediation primarily through water diversion and the removal or treatment of contaminant sources, rather than through treating the groundwater directly. Therefore STPA did not develop numerical groundwater quality objectives. STPA states that any potential adverse environmental effects would relate to the use of sub-surface barriers to alter groundwater flows. One such effect is groundwater mounding to the east of the Tar Ponds, but STPA would minimize offsite effects through drainage and groundwater control measures.

The Project design originally included groundwater wells in case pumping might be required. However, at the hearings, STPA advised the Panel that recent pumping test results indicated less groundwater flow than previously expected and consequently they would use passive groundwater collection techniques rather than pumping to capture groundwater contaminants.

The Project would address existing contaminated surface water by removing, containing, or treating sources of contamination, and by diverting watercourses away from areas of contamination. STPA would protect downstream water quality in the Project area from further degradation by treating wastewater discharges and controlling runoff. Discharge criteria would be based on previously developed site-specific surface water quality criteria and compliance requirements under the *Fisheries Act*. STPA would monitor the quality of

collected groundwater and surface water flows on a schedule still to be established. The EIS stated that where surface water criteria are exceeded, contaminated water would be collected and treated, the source of contamination determined, and corrective actions taken.

4.6.2 Government and Public Concerns

With respect to groundwater and surface water, the Panel mostly heard comments relating to the anticipated beneficial effects of the Project rather than adverse effects that might result from remedial activities. As those beneficial effects relate closely to post-remediation groundwater quality, the issue of performance and reliability of the proposed remedial measures is presented in detail in this section. Related matters can be found in other sections of this report.

Government agreed with STPA that the Project is expected to improve both groundwater and surface water quality. Both the federal and provincial environment departments noted the importance of a monitoring program and the need for more information.

Environment Canada advised the Panel that the interaction of surface waters with groundwater is a key consideration in the overall remediation approach, and that, while it is known that contaminants have found their way to the intermediate bedrock on the Coke Ovens site, relatively limited information is available on the lower bedrock units. Environment Canada further commented that a preliminary quantitative assessment of the proposed control measures would have been helpful in evaluating the Project. To address these concerns the department recommended that STPA conduct additional modelling and use the results in the final design of the Project's surface and groundwater control features.

The two environment departments held somewhat different views on the proposed solidification / stabilization of Tar Ponds sediment. The provincial department expressed more confidence in the proposed strategy than did its federal counterpart. While Environment Canada acknowledged that solidification / stabilization is a proven technology, they stated that its reliability is highly dependent upon site-specific conditions and that therefore site-specific performance criteria should be developed. Environment Canada did not agree with STPA's proposed strength criterion and recommended that solidification / stabilization criteria for the Tar Ponds should have a scientific basis; that a minimum criterion of 50 psi be adopted until detailed engineering analysis demonstrates that the proposed 17 to 20 psi is sufficient to accommodate construction equipment, the cap and likely future use scenarios; and that STPA's testing protocol be designed to address issues related to variability in the quality of the solidification / stabilization product.

Both environment departments addressed the need for specific wastewater treatment criteria and related monitoring. Environment Canada mentioned that monitoring for the *Fisheries Act* compliance should include testing for both acute lethality and sub-lethal or chronic effects.

Environment Canada stated that capping the Tar Ponds and Coke Ovens sites in order to minimize the release of contaminants to the receiving environment would have a major influence on the effectiveness of the overall remedial effort. The department identified information gaps respecting the design of the Tar Ponds cap that would make it difficult to verify the performance of the cap and the effectiveness of mitigation measures and monitoring. These gaps included an appropriate rationale to justify the selection of the thickness of the cap; potential interactions of a separate

gas or liquid (NAPL) phase with the clay cap and geosynthetic liners; gas generation within the solidified / stabilized sediment and the potential need for a gas migration pathway; and surface drainage. In addition, given that groundwater would serve as one of the pathways from the remediated sites to Sydney Harbour, Environment Canada pointed out that STPA's analysis of the post-remediation flux of contaminant to the harbour did not have an empirical basis. Environment Canada provided the Panel with specific recommendations to address these concerns.

Non-government participants made both technical and non-technical presentations to the Panel, in support of using solidification / stabilization technology. Representatives of the cement industry provided information on technical aspects of solidification / stabilization, use of the technology at sites in the United States with similarities to the Tar Ponds site, and on long-term effectiveness. Industry representatives advised the Panel as follows:

- Solidification / stabilization is a well established and flexible treatment technology proven to protect human health and the environment;
- The ability of solidification / stabilization to treat waste with large quantities of organics has been well demonstrated;
- Long-term effectiveness studies have demonstrated that solidification and stabilization can be an effective long-term “walk away” solution;
- Superfund Projects are only the tip of the iceberg when it comes to solidification / stabilization remediation applications; commercial applications are far greater in number;
- In-place solidification / stabilization treatment reduces risks posed to the surrounding community and site workers by reducing volatile air emissions and

other risks associated with excavation, transport, processing, disposal, and replacement of contaminated sediment;

- Evidence shows that salt water environments pose no harm and in fact may be beneficial in solidification and stabilization remediation Projects; and
- Treatability studies are required for every prospective solidification / stabilization project to determine viability.

The Panel heard discussion about solidification / stabilization performance criteria relating to unconfined compressive strength (UCS), permeability, and leachability. Representatives of the cement industry told the Panel that unconfined compressive strength, in general, has no direct relationship to leachability, but permeability has a strong relationship to leachability – other factors being equal, the lower the permeability, the lower the leachability.

Industry representatives also told the Panel that, with respect to the Tar Ponds / Coke Ovens site remediation Project:

- A site-specific leaching test program would be able to address site-specific conditions in test samples;
- The Project could include testing for freeze-thaw, durability, and salt-like exposure characteristics;
- Effective solidification and stabilization of the contaminants to prevent the ongoing risk of release and exposure presently existing at the site provides a positive environmental effect;
- All leaching tests performed on the treated samples yielded PCB leaching values below detection limits; and
- Mitigative measures are available to address all of the concerns expressed by interveners.

Those questioning the appropriateness of solidification / stabilization for the Project cautioned the Panel that wide application of a technology does not make it proven (this requires evaluation of results over time) and that, in relation to the characteristics of the Tar Ponds, the technology has not been shown to be effective. Concerns with the technology were:

- Its ability to effectively treat organic contaminants in materials with a high organic content;
- The compressive strength criteria proposed by STPA,
- The appropriateness of using leachate testing protocols, originally developed to categorize hazardous waste, to evaluate performance;
- The inability to monitor the capped solidified / stabilized sediments for failure;
- Sea water is highly corrosive and detrimental to the durability and stability of concrete matrices;
- Impairment of clay liners due to interactions with cement related calcium;
- Long-term ineffectiveness due to failure of synthetic membranes used in conjunction with solidification / stabilization;
- Use of lower quality / less marketable cement products for solidification / stabilization applications;
- Mobilization of phenols and other organic contaminants
- Problematic residues in cements resulting from use of industrial, agricultural and municipal waste materials in its manufacture; and
- Deterioration of cement, resulting in contaminant release, (including the constituents of the cements), and the need for additional safeguards.

Concerns with the application of the technology to Tar Ponds sediments were:

- The uniqueness and heterogeneity of the Tar Ponds sediments;
- The lack of defined remediation goals;
- The elevated detection limits used in the Project's leachability tests;
- Test results for unconfined compressive strength declining over time; and
- The need for a funded monitoring program with an indefinite end period.

Members of the community expressed concerns that contaminated groundwater would flow from the Coke Ovens and Tar Ponds sites to groundwater tables and contribute to the contamination of the intermediate and deep groundwater aquifers. Some participants also expressed concern that contaminated groundwater from the SYSCO and closed landfill sites would influence the Project site or the harbour, and that groundwater in the area of the Tar Ponds could migrate into basements of nearby residential properties.

4.6.3 Panel Conclusions and Recommendations

The Panel observes that the principal remediation approach for the Coke Ovens site relies on excavation and destruction of some of the contaminants, and the isolation and containment of remaining contaminants within a series of groundwater interception and diversion trenches. This would result in reduced exposure of groundwater and surface water to contaminants. Some of the remaining contaminated groundwater would be collected as it flows to the Tar Ponds and treated in an engineered water treatment plant. STPA has indicated that continual groundwater monitoring and modelling would be performed during the construction and operation phase of the Project. Many of the Panel's recommendations relate to this intention.

The proposed construction of lined channels to reroute surface waters in the Project

area and the solidification / stabilization of the Tar Ponds would also alter the current groundwater discharge patterns, and therefore have potential to alter the existing groundwater and surface water flow patterns in the surrounding environment.

The Panel also observes that STPA proposes to focus on the shallow components of the local groundwater systems, on the basis that the intermediate and deep bedrock hydrostratigraphic units are of little concern in the context of the current Project. Relatively limited information is available on these lower bedrock units, but the Panel is aware that contaminants have been documented in the intermediate bedrock

The Panel agrees that the configuration and integrity of the cap would have a major influence on the effectiveness of the overall remedial effort, and that the existing information gaps associated with the design of the surface capping at the Coke Ovens and the Tar Ponds be clearly specified. The EIS Guidelines require STPA to describe all measures that would be taken to mitigate negative effects of the Project. The Panel believes that monitoring for both success or failure, and environmental impacts of the proposed capping, must be integral components of the remedial process.

STPA has identified one potential adverse effect – localized mounding of groundwater and changes in the groundwater flow field following installation of groundwater control systems such as barrier walls. However, the Panel concludes that effective mitigation measures such as purge well or French drain systems could be implemented to avoid and minimize any such effects. Groundwater monitoring and modeling during the construction and the operation phase should be continuous and if problems are encountered they should trigger the implementation of mitigation

measures. Consequently, the Panel does not anticipate significant adverse residual effects.

The contaminated groundwater that is contained within the lower till and the fractured portion of the bedrock would continue to flow from the Coke Ovens site. The majority of this water is likely to flow directly to the Tar Ponds. The modelling of the groundwater from the Coke Ovens site has determined that there are no significant impacts from groundwater emanating from the Coke Ovens site.

The Panel agrees with Environment Canada that the interaction of surface waters and groundwater is a key consideration in the overall remediation approach to both the Tar Ponds and the Coke Oven Site and that the proposed Project is designed to minimize or eliminate the need for treatment of contaminated groundwater. If the proposed control features, along with treatment of contaminated waters, achieve their stated objectives, changes would be mostly positive. However, the Panel agrees with Environment Canada's conclusions that (a) STPA needs to clarify how the proposed mitigation measures would minimize and control contaminated groundwater and surface water movement ; (b) a preliminary quantitative assessment of the proposed control measures would have been helpful in evaluating the Project; and (c) STPA should start implementing a proper monitoring network plan prior to construction so that the actual response of the groundwater system can be tracked and remediated.

Recommendation # 7

Groundwater and Surface Water Protection Design Requirements

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- Incorporate hydrogeological modelling results into the final design of the groundwater and surface water control measures and the monitoring network;
- Provide detailed calculations of the volume of groundwater that could flow through the Coke Ovens site following surface water diversion and the installation of the underground barriers and the surface cap;
- Assess potential hydrostatic mounding that may be generated when groundwater flow encounters cut-off walls and address the impact of mounding, if required.; and
- Define and model the flow pattern of both ground water intrusion from the Coke Oven site and infiltration of sea water from the harbour to identify the amount of water that could collect under the monolith, including seasonal changes.

Recommendation #8

Groundwater Monitoring Program

The Panel recommends that, prior to providing funds or issuing approvals to proceed with the Project, NSEL and PWGSC require STPA to develop a detailed groundwater monitoring program for the various Project areas, including the intermediate and deeper bedrock zones. The program should demonstrate:

- How the distribution and location of the water sampling wells would (a) detect the amount of water that would penetrate to the contaminated material through the cap and as a result of the modified groundwater flow regime, and (b) identify potential

- **underground flows of contamination from the Coke Ovens site; and**
- **How the flow of leachate from the municipal landfill site would be monitored and mitigated.**

STPA indicated that the clay liner would have an average thickness of one metre and a minimum thickness of 0.3 metres yet no scientific rationale was presented to justify the selection of these design criteria. As well, the Panel notes that the main impervious layer in the cap would be clay that would have a hydraulic conductivity of 1×10^{-6} cm/s (the permeability of the underlying geosynthetic liner was not specified). This represents a potential flow rate of approximately 1 ft/year. The effective flow rate through the solidification / stabilization treated sediment could be higher due to cracks or fractures developing in the mass during the setting process. Therefore, the Panel is concerned with contaminants mobilizing and permeating through the sediment / soil zone.

The Panel agrees that the interactions of a separate gas or liquid (NAPL) phase with the clay cap and any geosynthetic liners should be assessed because it is important to determine if any gas would be generated and at what rate. Gas generated in the solidified sediments could build up under the GCL liner and require a migration pathway under the liner, or vents through the liner, to allow it to escape. Although STPA has stated that gas would not be generated in the matrix, the designs for solidification / stabilization of the sediment and the construction of the cap should provide for management of gas potentially generated during the life of the cap.

The Panel observes that water could pond on top of the geosynthetic liner if the surface of the solidified sediment is not graded, resulting in saturated, and possibly anaerobic, areas that could affect vegetative growth and

deteriorate the GCL layer over time. The Panel agrees with Environment Canada that the modelling efforts should also evaluate the design to determine if evaporation and evapotranspiration would be adequate to prevent ponding or if modification of the design is required to affect drainage.

Recommendation # 9

Cap Design

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- **Develop scientific and engineering criteria to design the Tar Ponds cap, including thickness and hydraulic conductivity criteria for the various layers; and**
- **Describe how the final design and implementation of both Tar Ponds and Coke Ovens site caps would respond potential problems such as exposure to repeated freeze / thaw cycles, non-aqueous phase layer (NAPL) migration, generation and migration of gas under the capping layer, erosion, and fissures.**

Recommendation # 10

Cap Monitoring Program

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to develop a cap monitoring program with an aim to:

- **Ensure that the physical integrity of the caps at the Tar Ponds and Coke Ovens sites can be effectively managed;**

- **Assess the integrity of the monolith structure within saline conditions; and**
- **Assess the permeability of the monolith cap under freeze / thaw conditions.**

The Panel understands that STPA has made use of proven technology as a prime objective for the Project and that the primary technology for remediating the Tar Ponds is physical containment. Environment Canada, a participant in the development of the Project concept agrees with STPA on the relative importance of solidification / stabilization compared to containment. Regardless of its importance, there was considerable discussion during the hearings about the extent to which solidification / stabilization is a proven technology for application in the Tar Ponds setting (an estuarine environment with organic contaminants in organically enriched sediments). The Panel heard that solidification / stabilization is widely used in Superfund cleanups and has a documented track record for the treatment of metals. The Panel was also told that solidification / stabilization was originally considered to be less effective in treating organics but new methods are evolving. However, a representative from the cement industry agreed that it was still “a challenge.” The Panel asked for examples of comparable use of solidification / stabilization (high organics, marine context, with use of a complex internal drainage system) over an extended period of time. The information presented, while helpful, did not convince the Panel that this technology can be considered entirely proven, and recommendations made by Environment Canada for field testing underscored this conclusion.

STPA told the Panel that they were confident that satisfactory solidification could be achieved, and that a range of compressive strengths was possible for a reasonable increase in cost. The Panel agrees that this seems

probable. The Panel is less certain about the prospects for effective stabilization of organic contaminants. As noted earlier in this chapter presently the mobility of the organic contaminants is reduced by their hydrophobic nature and binding to fine organic particles. Hence the main risk of the contaminants leaving the Tar Ponds is by physical relocation of the sediments rather than through leaching. STPA presented the solidification / stabilization technology in the EIS as both solidifying, mainly to provide necessary compressive strength to allow heavy equipment on top of the sediments to complete the remediation and to allow for a range of future uses, and stabilizing the contaminants to reduce the risk of leaching over the duration of the Project and beyond – an indeterminate time period.

Given that the contaminants are already considered to be stable, the Panel assumes that an appropriate goal would be to ensure that this stability is maintained, regardless of what technology is applied. However, the Panel heard concerns at the hearings from other presenters that the application of solidification / stabilization could in fact destabilize contaminants to a certain extent. One presenter advised the Panel that phenols would be solubilised by solidification / stabilization and of his knowledge of a US study that showed 100 per cent recovery of phenols in leachate testing. While STPA responded to this information, the Panel found the response unconvincing.

The Panel also notes that results of preliminary solidification / stabilization testing presented by STPA in its Solidification Technical Memo Report suggest that in certain circumstances the leachability of some PAHs increased after solidification / stabilization treatment, sometimes by a factor of 4 or 5. The Panel notes that the TCLP test proposed for use by STPA only has criteria for one PAH compound and questions the appropriateness of leachate testing criteria serving as the sole

indicator of the mobility of contaminants. The technical memo revealed difficulties (i.e. elevated detection limits) with the analysis of PCBs in leachate thus providing the Panel with little assurance that, following treatment, PCBs would be stabilized.

The EIS, addressing the solidification / stabilization of contaminated sediments, provides the following statement “The performance requirements would be designed based on the results of a treatability study and appropriate guidance documents. Tests for 28-day compressive strength and leachability (emphasis added) would be used as the primary acceptance criteria for the solidified sediment.” The Panel does not believe this commitment has been met.

The Panel concludes that, similar to the Tar Cell scenario, work is still needed to prove the suitability of solidification / stabilization technology for the Tar Ponds setting before proceeding to full application. The Panel believes that a first step would be for regulators in consultation with STPA to establish performance criteria for compressive strength, permeability and stabilization. The Panel believes that the performance criteria for stabilization should either be set at or very close to the status quo currently found in the Tar Pond sediments in-situ – in other words, solidification / stabilization treatment should not significantly destabilize contaminants, especially if STPA still asserts that eventually the remediation Project would achieve “walk away” status. The Panel also believes this to be particularly important if STPA decides to proceed with full containment, including PCB sediments greater than 50 mg/kg.

The Panel notes that STPA has not clearly identified the manner in which solidification / stabilization technology would be applied to the Tar Cell materials. In its submission to the Panel titled “The Alternative

– Solidification / Stabilization with No Incineration” STPA indicates that solidification / stabilization activities on the Coke Ovens site would not require excavation of Tar Cell material. At the hearings both oral and written material presented suggested otherwise.

The Panel notes that STPA has not presented the treatability data on the 66,000 tonnes of bottom ash to be returned to the Tar Ponds for solidification / stabilization.

Recommendation # 11

Solidification / Stabilization Criteria

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- **Develop criteria for the solidification / stabilization process to be used for treating the North Tar Pond sediment, South Tar Pond sediment, incinerator bottom ash, Tar Cell materials and Coke Ovens Brook sediments;**
- **As part of criteria development establish site-specific leachate criteria for PAHs and PCBs and data quality objectives to demonstrate that remedial activities would not significantly increase contaminant mobility; and**
- **Provide the results of the above to Environment Canada and NSEL for review and comment.**

If the results of the treatability study or pilot testing were to indicate treatment by solidification / stabilization cannot meet the required performance criteria, the Panel observes that, while removal of solidification / stabilization from the Project would still fall within the terms of the Memorandum of Agreement, this alternative means of carrying

out the Project (by containment only) was not presented during the environmental assessment process. This would mean that STPA would need to modify the Project, possibly revisiting other alternative means, and undergo additional environmental assessment as required.

Recommendation # 12

Treatability Study

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- **Assess the heterogeneity of Tar Ponds sediments and Tar Cell materials for characteristics relevant to solidification / stabilization;**
- **Use the results of the above to conduct a laboratory solidification / stabilization treatability study on the South Tar Ponds sediment;**
- **Based on the laboratory results develop interim specifications on the solidification / stabilization treatment formula (additives and dosage rates) to be used for the North and South Tar Ponds and Tar Cell; and**
- **Provide the results of the above to Environment Canada and NSEL for review and comment.**

Recommendation # 13

Pilot Scale Study

The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- **Conduct a pilot in-situ study on both ponds including site specific**

- **evaluations of the proposed solidification / stabilization process;**
- **The evaluation should include use of the treatment formula specifications developed above and use of at least one type of construction technique proposed for full-scale application; and**
- **Conduct a sampling and testing program of the S / S products over time where samples of the in place product are collected and tested to determine compliance with the pre-established criteria; and**
- **Provide the results of the above to Environment Canada and NSEL for review and comment.**

The Panel acknowledges that treatment requirements for Project wastewaters are not unique and that technologies exist to treat to acceptable levels. Nevertheless, for discharges to receiving waters, the treatment specifications would be site-specific and the federal regulator has spoken of the need for monitoring for both acute lethality and sub-lethal or chronic effects.

Recommendation # 14

Wastewater Treatment

The Panel recommends that NSEL require STPA, when submitting information in support of approvals to discharge wastewaters, to:

- **Provide details of the wastewater treatment methods to be employed;**
- **Identify the contaminants to be treated and their related numerical discharge criteria; and**
- **Provide information on how compliance with the requirements under Section 36 of the Fisheries Act would be demonstrated.**

With respect to the “full containment, no incineration” alternative, the Panel, while realizing the magnitude of some adverse environmental effects would increase, has identified no new concerns. The Panel concludes that, subject to the Panel’s recommendations, the identified mitigation measures would adequately manage potential adverse effects of the alternative on groundwater and surface water.

4.7 TERRESTRIAL ENVIRONMENT AND FRESHWATER HABITAT

4.7.1 Existing Conditions

The EIS states that for most of the remediation site and the surrounding urban areas surface soils have been removed and replaced with various forms of fill. It describes terrestrial habitat on the Coke Ovens site as shrub thickets, meadows, or swales with the vegetation characteristic of disturbed sites. The shoreline of the Tar Ponds is vegetated with typical tidal shore vegetation. Nearly half of the plants at both the Tar Ponds and Coke Ovens site are introduced species and the remainder are mostly common native plants.

American crows and common ravens are abundant in the Project area. The EIS advises that in spite of the high pollution levels and extensive urban and industrial development, the waters around Sydney support an abundance of water birds. The Tar Ponds provide over wintering habitat for ducks, gulls, and crows and summer breeding habitat for ducks, killdeer, and song sparrows. (While North Pond is presently more closely connected to the marine environment the proposed Project will transform it to primarily a terrestrial environment. The effects on North Pond are thus included in this section.) Mammals thought to use the two sites include cats, foxes, rodents, coyotes, and deer.

The EIS describes the results of a 2001 fish biodiversity and habitat survey of Coke Ovens Brook and its tributaries. The only fish species observed were mummichog and ninespine stickleback. The condition of the fish found varied from apparently healthy to fish with growths and diseased fish. The benthic freshwater communities on the Coke Oven site were characteristic of degraded environmental conditions. In South Pond spawning and rearing areas for mummichogs and brown bullhead were observed. American eel have been observed in South Pond. The dam at Ferry Street is a barrier to fish migration.

STPA has not identified species at risk or other species of special conservation status in the area of the Tar Ponds and Coke Ovens site. An inventory of plant and animal life on the Coke Ovens site and the shores of the Tar Ponds documented the occurrence of at least two mosses that appear to be rare in the Maritimes and the first record of two species of snails occurring in the Maritimes. The author of the report concludes that these findings were likely a consequence of limited field work rather than a true reflection of species rarity.

4.7.2 STPA Assessment

STPA has concluded that remediation measures on the Tar Ponds and Coke Ovens site are expected to have generally beneficial effects on soil and soil quality and the human and ecological risk assessments have indicated that the offsite soil related risks will be below levels of significance. STPA has stated that it will test the capping materials to ensure they are free of contaminants, maintain the containment cap and groundwater control measures to ensure that the contained contaminated material does not re-contaminate surface soils, and monitor emissions and deposition rates and surface soil concentrations. Its assessment of remaining aspects of the terrestrial environment focussed on habitat characteristics and the exposure of

wildlife to contaminants as a result of earthworks and landfarming activities.

STPA advised the Panel that 15 to 20 years would be required for the site to re-vegetate naturally. At the hearings STPA advised that this comment applied only to areas designated for habitat restoration and that, in order to protect the integrity of the cap, a managed and shallow-rooted plant community would need to be retained.

The results of the ecological risk assessment indicated potential for long-term effects to robins and other insectivorous birds due to consumption of insects resident in the disturbed and contaminated landfarm area soils. The EIS recommends attracting fewer birds to the site by mowing the grass very short to curtail ground nesting.

STPA has recognized that the alteration of the Tar Ponds to a terrestrial environment will result in a loss of aquatic wildlife habitat but believes there is abundant habitat with similar characteristics throughout the South Arm and Sydney Harbour. Furthermore, it believes the Project will result in the beneficial effect of reducing wildlife exposure to contaminated materials.

STPA's identified mitigation and follow-up measures for terrestrial habitat as follows:

- Maximize natural grassland and riparian habitat within future plans for the Project sites;
- Reduce or eliminate ground nesting habitat within the Coke Ovens site;
- Clear other vegetated areas during winter to avoid onsite nesting of birds;
- Monitor new habitat for birds, vegetation, and wildlife;
- Habitat management and maintenance; and

- Site inspections during the 25 year post-remediation phase of the Project to ensure the integrity of the cover system.

The relocation of Coke Ovens Brook is a preventative work and falls outside of the Panel's mandate. As noted in the EIS, the new configuration of surface water bodies on the Coke Ovens site is the starting point to assess effects on freshwater habitat. The Project will require excavation of the bed of the brook running through the Coke Ovens Brook Connector. Excavation will destroy what is already severely degraded habitat and replace it with an engineered channel. Because the channel is required to capture mobile groundwater contaminants in the area, its function as habitat will be limited to fish migration.

STPA has identified that remedial activities may cause temporary disruptions between upstream and downstream fish habitat and suspension and transport of contaminated materials downstream and eventually into the harbour. The positive benefits of remediation relate to surface and groundwater quality and are discussed in Section 4.6. The replacement of the Ferry Street dam and control structure with the proposed channel will enable fish passage, resulting in another beneficial effect.

As mitigation STPA proposes to rescue fish in Coke Ovens Brook Connector prior to brook excavation; however it states that the practicality and appropriateness of fish rescue will depend on a variety of factors requiring further evaluation. STPA will monitor watercourses on site to document the expected return of fish species to the watershed.

STPA concluded that there were no terrestrial, avian, and freshwater species of special concern (e.g. species at risk) on Project sites.

STPA's overall conclusion was that, following completion of Project activities, remediated areas would improve terrestrial and freshwater habitat. While some loss of wildlife and aquatic habitat area is expected, it would not be significant. Mitigation measures would minimize direct adverse effects on birds and fish.

4.7.3 Government and Public Concerns

The NSDNR disagreed with STPA's conclusion about the loss of habitat found in the Tar Ponds. The department found fault in the EIS for failing to restore or compensate for the loss of wetland and inter-tidal habitat. It stated that it was not reasonable to assume that birds would move to other suitable habitat without having an impact on birds already resident in the new location. It advocated that, regardless of environmental quality, the Tar Ponds provide wildlife habitat and that provincial and federal policy stipulate that restoration or compensation is required in situations, such as with this Project, where loss of wetland habitat is unavoidable.

DFO advised the Panel that the realignment of Coke Ovens Brook and the main remediation project should result in a restoration of damaged fresh water habitat, which is consistent with a policy objective to achieve a net gain of productive capacity of fish habitat. DFO wants to be consulted during the design and construction of the new channels to ensure they provide for fish passage to the more suitable upstream areas of habitat. The department advised the Panel that incorporating fish passage into the design of the Project's channels would not be difficult. It recommends that STPA commit to long-term monitoring fish abundance and health in the watershed commenting that this information would be a valuable indicator of freshwater ecosystem health.

The Panel heard from DFO that, unlike the lower reaches of Coke Ovens and Wash Brooks, the upper reaches include areas of good habitat. The community has an interest in this habitat and volunteers have installed numerous habitat enhancement structures in Wash Brook and have planted riparian vegetation.

The concerns of the public centred on wetland destruction and replacement and the deteriorated condition of fish in the watershed due to pollution.

4.7.4 Panel Conclusions and Recommendations

The Panel shares the concern of others with the loss of wetland and inter-tidal habitat resulting from the destruction of the North and South Ponds following solidification / stabilization and capping. Various species of birds use the water as a staging area. The area also provided habitat for some fish species and invertebrates. The Panel recognizes that environmental quality is expected to improve and the removal of the barrier to migration at Ferry Street will offset fish habitat loss. There is no corresponding offset for wildlife. The fate of the Tar Ponds is both a social and an environmental issue and the Panel's recommendation on this matter is found in Section 6.4.

The Panel recognizes DFO's expertise with fish passage requirements and design and believes that the ongoing design of the Project should incorporate this expertise. The Panel believes that onsite monitoring of fish species to document the return of fish to the area is of value but agrees with DFO that monitoring in the watershed is a more appropriate approach to evaluating ecosystem restoration.

Recommendation # 15

Fish Migration

The Panel recommends that NSEL and PWGSC require STPA to consult with DFO in the design of the Project's constructed watercourses and in the design of a long-term aquatic biodiversity monitoring study of the Coke Ovens Brook and Wash Brook watersheds.

The Panel notes that STPA is expecting to mitigate the loss of terrestrial habitat by encouraging maximized natural grassland and riparian habitat in future use plans. The Panel understands, however, that the main purpose for establishing grassland would be to avoid penetration of the cap by deep roots rather than necessarily to create viable habitat, and that in an urban setting wild grassland is rarely maintained as opposed to conventional mowed areas. In section 6.4.3, when discussing future uses, the Panel recommends that STPA commit to a native tree planting strategy for both aesthetic and ecological reasons. The Panel would encourage STPA to use this opportunity to maximize the creation of multi-niche habitat, particularly for birds.

With respect to soil quality and the effectiveness of the proposed landfarming the Panel notes the conclusion of STPA's own consultant on landfarming:

It is noted that the proposed Coke Ovens corrective action includes a capping component which is designed to address the risk associated with shallow soil, by greatly decreasing the potential for exposure. The additional risk reduction provided by landfarming...may therefore be negligible, even if (landfarming was) effective in decreasing contaminant concentrations.

And the conclusion of its own ecological risk assessment on landfarming:

Results of the ERA indicate that there is some potential for long term effects to occur in robins (and therefore other insectivorous bird species) from this source. This may cause harm to local bird populations that feed on insects and vegetation within the landfarmed areas.

As there are other potential adverse effects associated with landfarming, such as impaired air quality in residential areas, the Panel fails to understand the need for this remedial activity.

Recommendation #16

Landfarming

The Panel recommends that, prior to providing funds or issuing approvals, STPA reevaluate the need to undertake landfarming at the Coke Ovens site and provide the rationale for the decision to the Project's funding partners for approval.

4.8 MARINE ENVIRONMENT

4.8.1 Existing Conditions

The EIS describes Sydney Harbour as a shallow Y-shaped inlet up to 21 m deep, 21 km long and 3 km wide at its mouth. The Tar Ponds are the remnants of an estuarine area and are located on the east side of the harbour's South Arm. The area of the Tar Ponds is the most industrialized and polluted area of the harbour. Pollution is severe due to the contaminants from existing and past sources. In addition to the discharges from the Tar Ponds, pollution sources are, or have been, treated and untreated municipal wastewater; and wastes from shipping and ship repairing, fish processing, coal mining and processing facilities, and steel making.

According to the EIS the Tar Ponds are a major source of the hydrocarbons contamination found in the harbour. A 2002 Fisheries and Oceans led study estimated the total quantity of PAHs entering the harbour annually at 289 kg of which more than 50% is from the Tar Ponds. The same study concluded that concentrations of PAH found in Sydney Harbour sediments are potentially highly toxic and exceed a national guideline criterion by more than 70 times for some PAHs in almost all of the South Arm. Significant PCB sediment contamination appeared to be mostly restricted to the South Arm. There is evidence that the Tar Ponds may not have been the most significant source of PCB contamination.

The South Arm of Sydney Harbour was permanently closed to lobster and shellfish fishing in the 1980s due to unacceptable levels of PAHs resulting from industrial pollution.

4.8.2 STPA Assessment

STPA's assessment of the effects of remediation on the marine environment focused on the permanent loss of habitat due to the capping of the North Pond; the potential for short-term increases in contaminant concentrations in the harbour due to remedial activities; and the expected beneficial and long-term effect on marine environmental quality due to decreased contaminant release from the Tar Ponds.

To address the issues of short-term increases in contaminant concentrations in the harbour and long-term beneficial effects on marine environmental quality STPA chose to model the fate of contaminants in water and sediments of the South Arm before remediation, during remediation, and following remediation. The modelling was based on a mass balance of contaminants and scenario development. The period of modelling was 60 years; however, the first 39 years were only intended to allow the

model to come to steady-state conditions. In Year 40, the contaminant flux rate from the Tar Ponds was increased by a factor of five simulating a potential short-term increased rate of contaminant release to the harbour due to remedial activities. For Years 41 to 60 (after remediation), the contaminant flux to the harbour was reduced to 10% of the steady state conditions. Both the short-term and long-term changes in fluxes are based on STPA's professional judgement.

STPA compared modelling results to environmental quality criteria. No exceedances of criteria were identified for water in the South Arm. For sediment the modelling indicated incremental increases in the concentrations of some PAHs marginally higher than national sediment quality guideline criteria during Year 40. After Year 40 the Tar Ponds contaminant contribution to harbour waters will drop to the assumed 10% of existing conditions. For sediments, concentrations will likely be 10% to 30% of existing concentrations.

STPA concluded that there were no marine species of special concern (e.g. species at risk) present in Sydney Harbour.

STPA has not identified mitigation measures specific to the marine environment, however the Panel recognizes that measures identified elsewhere to protect surface water and groundwater are intended also to protect Sydney Harbour. STPA intends to conduct short- and long-term monitoring of water quality in the new channel — short-term monitoring to assess effectiveness of upstream mitigation measures and long-term monitoring to assess effectiveness of remedial measures. It recognizes the possible need for long-term monitoring of the expected improvements in environmental quality of the harbour but does not see this as STPA's responsibility.

STPA concluded that the overall result of the Project on the marine environment would be to replace the degraded North Pond habitat with a channel environment and to offset adverse effects resulting from habitat loss by long-term improvements in marine environmental quality.

4.8.3 Government and Public Concerns

Fisheries and Oceans Canada (DFO) advised the Panel of DFO's lead in a recent multi-disciplinary research program to assess the environmental effects of contaminants in Sydney Harbour. That work resulted in several tools that can be used to identify and monitor changes in Sydney Harbour, and allowed DFO to conclude that natural processes of capping and microbial breakdown are helping Sydney Harbour to recover from the effects of past releases of pollutants. DFO believes the contaminants in the marine sediments within the harbour should be left to remediate naturally. While reluctant to predict when the quality of harbour sediments might reach acceptable conditions, DFO explained that if pollution sources were removed, recovery would be measured in decades rather than centuries.

DFO and two other federal departments – Environment Canada and Natural Resources Canada – advised the Panel on the need for short- and long-term environmental effects monitoring. They agreed that the information presented by STPA on the Project's influence on Sydney Harbour was not adequately addressed and consequently the short-term contaminant effects associated with remedial activities and the long-term positive effects of the remedial measures should be considered through ecological risk assessment. Observing that ecological risk assessments had been completed for other aspects of the Project – incineration and landfarming – and that STPA's contaminant fate modelling indicated concentrations of contaminants at levels of

concern throughout the South Arm of the harbour, the departments' position was that ecological risk assessment of remedial activities was necessary. All spoke of risk assessments informing the design of any environmental effects monitoring program. NRCan advised of the possibility of increased mobility of some contaminants during the recovery process and of the need for risk assessment and monitoring to guard against unanticipated adverse effects.

The most frequent concern heard from the public on the existing and future condition of the harbour was related to the effectiveness of remedial measures and implications for the harbour. Those concerns are addressed in this report as surface water and groundwater issues as those media are assumed to be the most important direct sources of contaminants to the harbour. The Panel heard from presenters on their concerns about the natural recovery processes underway in the harbour, PAHs in lobster, a past remediation effort resulting in additional harbour degradation, and the past lack of enforcement of environmental legislation that has resulted in the existing harbour conditions. One participant spoke of his concern with "unrecognized pollutants", such as substances found in personal care products and pharmaceuticals, which are found in the biota in other harbours and would likely be found in Sydney Harbour as well.

In response to a Panel question about the community health implications of containing contaminants in-place rather than removing and destroying them, a medical professional spoke of the need for ongoing harbour monitoring and regular public access to monitoring results, because positive monitoring results showing improvements in environmental quality and in the fish species found in the harbour would assist in restoring the community's level of confidence.

4.8.4 Panel Conclusions and Recommendations

The Panel agrees with STPA's conclusion that if the Project is successfully implemented, its benefits would outweigh the permanent loss of North Pond marine habitat. Nevertheless concerns remain with assessment methodology employed by STPA, the potential for short-term deterioration of marine environmental quality due to the remediation activities, and the lack of attention given to environmental effects monitoring and follow-up.

Given the impact of the contaminants discharged to the Sydney Harbour during the operational phase of the Coke Oven site and the steel mill, and recognizing the potential for elevated contaminated levels during the period of active remediation, the Panel members conclude that the release of contaminants to the harbour must be effectively mitigated and that effectiveness demonstrated through monitoring.

The Panel previously concluded that the purpose of the Project is to remediate the Tar Ponds and Coke Ovens sites in such a manner that the risk posed by the contaminants is reduced. The Panel has been advised that the risk to human health, with controls in-place to prevent access, is minimal and that, due to binding to organics, the chief concern with contaminant mobility is relocation of Tar Ponds into the harbour by wave or current transport. Based on this information, and in full realization of the importance of the social concerns related to the Project, the Panel concludes that understanding the long-term environmental effects of the Project on Sydney Harbour is important. Furthermore the Panel believes that an ecological risk assessment of the positive effects on the harbour as a result of remediation information presented to date is required for the reasons presented by the federal departments – to assist in the design an effective monitoring

program as well as to guard against unanticipated adverse effects.

The guidelines for the EIS required that the document be analytical and complete. The Panel concludes that STPA respected the guideline condition in conducting human health risk assessments and an ecological risk assessment of effects relating to landfarming and incineration. The Panel believes that, given the relevance of Sydney Harbour to the Project, an ecological risk assessment of the Project's effects on the harbour is necessary. The Panel notes that an ecological risk assessment was done for landfarming, a relatively minor activity. Yet, although the results of the scenario modelling for the Harbour showing incremental increases in sediment contaminant concentrations exceeding environmental quality criteria, STPA did not carry out further detailed analysis. The Panel agrees with the recommendation of the three federal departments that a quantitative risk assessment analysis is required to predict changes in the flux of contaminants during and after remediation activity.

Recommendation # 17

Water Quality Monitoring

The Panel recommends that PWGSC and NSEL require STPA to:

- **Monitor the quality and discharge rate of both the ground water and the surface water to the marine environment during the entire construction phase of the and the Tar Ponds and Coke Ovens site remediation project; and**
- **Establish a permanent water quality monitoring program at the discharge of the channel to Sydney Harbour.**

Recommendation #18

Ecological Risk Assessment

The Panel recommends that PWGSC require STPA to undertake a quantitative assessment of the risk of remedial activities to marine receptors within the South Arm of Sydney Harbour. The risk assessment should incorporate changes in the flux of contaminants from the Tar Ponds during and following completion of the Project.

The Panel agrees with the public, STPA, and government agencies on the need for long-term monitoring of environmental conditions within Sydney Harbour. There is a need to assess the effectiveness of the remediation project and the effectiveness of other measures that have been taken in recent years to improve environmental quality in Sydney. The harbour has been degraded from multiple sources of pollution. While the Tar Ponds and Coke Ovens site may have been the worst offender there have been and continue to be others. The Panel is aware that, as Proponent of the remediation project, STPA may have responsibilities for monitoring the long-term recovery of the harbour. The Panel is also aware that the harbour is an area of federal jurisdiction, that federal money is supporting the Project, and that federal agencies are requesting harbour monitoring. In addition, the Panel notes that the recent study of existing conditions in the harbour was federally funded and that federal agencies have the required expertise to conduct long-term monitoring. Given all of the above, the Panel is not convinced that the responsibility for monitoring the recovery of the harbour lies entirely, or even predominantly, with STPA.

Recommendation # 19

Long-Term Monitoring of Sydney Harbour

The Panel recommends that PWGSC, in consultation with NRCan, DFO, Environment Canada, and STPA, design a long-term monitoring program to document improvements in the environmental quality of Sydney Harbour. DFO should assume the lead for long-term monitoring.

The Panel assumes that the federal science agencies will give appropriate consideration to unrecognized pollutants in the design and implementation of the long-term monitoring program.

4.9 EFFECTS ON THE CAPACITY OF RENEWABLE RESOURCES

STPA believes that the long-term effects of remediation activities on groundwater, surface water, and soil resources are expected to be positive and therefore the Project contributes to an overall improvement in the sustainability of these resources. Potential adverse effects on air quality, limited to the implementation of remedial measures, are of rather short duration. As indicated previously, STPA believes the removal of the North Pond from the marine environment is considered insignificant due to its condition and the availability of comparable habitat. In addition the Project is intended improve environmental quality in the harbour which has positive implications for fisheries and other uses in Sydney Harbour.

The Panel agrees with the position of STPA and concludes that recognizing identified mitigation measures and the Panel's recommendation, remediation activities are not likely to have any significant adverse effect on the capacity of renewable resources to meet the needs of the present and those of the future.

4.10 ACCIDENTS AND MALFUNCTIONS

4.10.1 STPA Assessment

STPA identified the following malfunctions and accidental scenarios as having the potential for adverse effects thus requiring further assessment.

- Failure of the water collection and treatment systems during excavation of contaminants;
- Failure of the groundwater diversion during excavation of contaminants;
- Failure of the groundwater diversion following completion of the remediation work;
- Failure of the surface water diversion from the Tar Ponds and Coke Ovens sites during excavation of contaminants;
- Onsite traffic accidents; and
- Failure of carbon filters or integrity of enclosures used in conditioning areas or on the Tar Cell.

STPA then went on to identify air quality, ground and surface water, soils, marine habitat and biota, freshwater habitat and biota, and terrestrial environment as components of the environment that may be adversely effect by the accidents and malfunctions. At the hearings STPA explained that the five fold increase in contaminant loading was intended to address accidents and malfunctions resulting in an increase in contaminants released to the harbour. It was described as a worst case scenario.

STPA concluded that all of the identified malfunction and accident scenarios are of short duration affecting only a small geographic area and with identified management measures in-place malfunctions and accidents related to remedial activities would be expected to be rare events and the consequences short-term and subject to immediate cleanup and corrective

measures, if required. Examples of the management measures were the Project's Environmental Management Plan, Environmental Protection Plans and Emergency Response and Contingency Plans, and the availability of a fully equipped HAZMAT vehicle.

4.10.2 Government and Public Concerns

Environment Canada provided the Panel with its comments on accidents and malfunction. Noting that it was an important aspect of the Project it commented that it anticipated that STPA would provide adequate information and details regarding methods to address malfunctions, spills and accidents in the yet to be developed Environmental Management Plan and Environmental Protection Plans. Environment Canada also had concerns with the limited malfunction scenarios described and the lack of discussion of worst case scenarios. The department identified the need for more information on contingency plans, including the public response plan, especially in the event monitoring information indicates an exceedance of air quality criteria and provided recommendations for the Panel to consider.

The public advised the Panel of its concern with failure of components of the Project – failure of solidification / stabilization, failure of synthetic liners, cap failure, failure of the pump and treat systems, and failure of the barrier walls.

The public also spoke of past analytical equipment failures and past malfunctioning of charcoal filter systems, and past laboratory error.

4.10.3 Conclusions and Recommendations

The Panel has considered the public's concern with potential failure or remedial

measures and has addressed these matters as design issues rather than accidents or malfunctions. For those relating to monitoring of air quality, the Panel has identified the need for improvements to and oversight of air monitoring and reporting procedures and believe these recommendations will lessen the potential for future malfunctioning of equipment and improve response to air quality incidents. As for Environment Canada's recommendations for more information, the Panel believes that some of its other recommendations will provide Environment Canada with the opportunity to participate in the development of Project planning documents relating to accidents and malfunctions.

4.11 EFFECTS OF THE ENVIRONMENT ON REMEDIATION

4.11.1 STPA Assessment

In its EIS, STPA identified four environmental conditions that could be reasonably expected to interact with the Project – severe weather, flooding, climate change, and seismic events. Heavy rains could interfere with remedial activities on both the Tar Ponds and Coke Ovens site and cause erosion of containment materials on both sites. Storm surges and heavy runoff / flooding could also affect remedial activities and long-term performance of containment materials. Climate change could worsen these events. All of the outcomes could result in the release of contaminated materials to the environment. Seismic events were concluded to be of little concern.

Conceptual measures identified to mitigate against effects related to severe weather and flooding were:

- Limiting exposed work areas scheduling of Project works;

- Providing wastewater storage capacity (for treated and untreated waters); and
- Progressive stabilization, cap construction and re-vegetation.

In addition the design of the Project will accommodate certain environmental conditions:

- The 1-in-100-year storm event;
- Additional storm water volumes as a result of increased urbanization; and
- Long-term sea level rise in the channel design.

During the hearings STPA advised the Panel that the compressive strength of the solidification / stabilization sediments located behind the barrier wall would be increased. That increase is intended to address preventing damage from a catastrophic storm surge. In response to questions from the Panel, STPA indicated damage to the proposed caps due to frost penetration and freeze / thaw conditions was a concern. STPA will be addressing that issue in the final design of remedial measures.

STPA concluded that the effects of the environment and site remediation would not likely result in significant adverse effects and that no additional mitigation measures or refinements to the Project were required.

4.11.2 Government and Public Concerns

A number of participants questioned whether or not the Project was designed adequately to prevent wave action and storm surges from damaging the Tar Ponds cap and channel walls and potentially releasing contaminated materials. The concern was often expressed in relation to the heightened risk of such occurrences due to climate change. NRCan advised the Panel that in its review of the EIS it had been concerned with the design of the Project and climate change implications; however, that concern was addressed when

STPA advised that the surface of the Tar Ponds cap was designed to be above a high water mark that had incorporated expected sea level rise and that rip-rap armour will protect the channel against possible erosion due to storm surges. Similarly, Environment Canada stated that it had not identified any concerns with the issue of climate change related storm events and damage to the remediated area.

The issue of frost damage to the remediated sites was a concern for the public. The representatives of the cement industry spoke of frost penetration and freeze / thaw as a design issue and the availability of a test for freeze / thaw durability. Both industry and the general public spoke of the possible influence of salt water on the integrity of the solidified / stabilized sediments. This same issue is addressed in more detail in Section 4.6.

4.11.3 Panel Conclusions

The Panel agrees with STPA that the effects of the environment on site remediation will not likely result in significant adverse effects. The Panel remains concerned with the potential influence of saltwater intrusion on the integrity of the solidified / stabilized sediments but recognizes features of the Project are designed to minimize exposure.

5 INCINERATION

5.1 COMPLETED AND PROPOSED ACTIVITIES

STPA intends to transport 120,000 tonnes (wet weight) of PCB contaminated sediments from the Tar Ponds and 26,300 tonnes of PAH contaminated materials from the Coke Ovens site by rail to an incinerator located at the Victoria Junction Coal Preparation Plant Site. STPA has selected the Phalen Mine Site near New Waterford as an alternate site. Destruction of the materials is expected to take three years, with an additional two years required for site infrastructure, and incinerator commissioning and decommissioning.

Candidate sites were selected and evaluated on the basis of public health and safety, environmental protection, and other social, technical and economic considerations. STPA established a separation or setback requirement of 500 meters from residences or farms around the incinerator facility.

Site preparation would include development of storage areas for feedstock, fly ash and bottom ash that would be equipped with a drainage system leading to a water treatment facility. A water collection and treatment system already exists at the VJ site, but would have to be constructed at the Phalen site.

STPA proposes to use either a rotary kiln or fluidized bed technology. Both technologies are widely used, but the rotary kiln is more commonly used for the types of materials and contaminants found at the Tar Ponds and Coke Oven sites. At the hearings STPA also indicated that they might consider using two incinerators rather than one, in order to achieve the required throughput.

The rotary kiln incinerator consists of a cylinder that is slightly inclined from the horizontal plane, which permits solid materials to move easily from the point of entry to the burner located at the lower end of the kiln. The kiln rotates at a very low speed to enable good heat transfer through its length. The major advantage of the rotary kiln is its ability to handle solid wastes of widely varying sizes, liquid wastes, material possessing high moisture content, sludge-like feed, and materials that form molten slag.

Fluidized bed combustors consist of a vertically oriented steel shell with a grid at the base containing a bed of sand. Partially dewatered sludge is fed into the lower portion of the furnace and air is injected through nozzles, which fluidizes both the bed of sand and the incoming sludge. The fluidized bed combustor requires a limited amount of excess air to ensure complete combustion of the sludge.

The incinerator would be a dedicated, temporary facility to be used only to incinerate contaminated materials that are a part of the Project. The facility would operate 24 hours a day, seven days a week for approximate 250 days a year, and would require an area of 2 to 5 hectares for the incinerator and ancillary facilities.

Before transportation to the incinerator site some of the excavated sediments would be dewatered and conditioned in preparation for incineration. This involves the addition of inert dry material to absorb remaining moisture at a ratio of 1 to 1. Feedstock conditioning is needed to attain uniform particle size and heat value. If the heat value is too high it can cause the combustion chamber of the incinerator to overheat. The blending material would initially be coal fly ash, and then bottom ash returned

from the incinerator, provided it meets acceptable criteria. STPA expects one train load of 28 – 30 rail cars would be required per day to transport the contaminated material to the VJ site.

Whichever technology is selected, STPA would require the incinerator to achieve a minimum Destruction Removal Efficiency (DRE) of 99.9999% for PCBs and 99.99% for PAHs.

The proposed incinerator system (Figure 9) will have a number of components including:

- Waste material feed preparation area;
- Waste feed system;
- Combustion chambers (primary and secondary);
- Exhaust gas stack;
- Air pollution control equipment;
- Ash handling / disposal system; and
- Energy and control systems.

The incinerator would require a steady stream of contaminated feed stock and therefore feed stock materials must be stored for several months in a staging area where stock piles of contaminated material are prepared and approved for processing. Both this area and possibly the incinerator would be enclosed within a temporary structure. The incinerator would be installed on a concrete pad.

Site mobilization is expected to take 6 to 8 weeks. Incinerator start-up is expected to take several days while the equipment slowly heats up to the temperature stipulated in the operational permit. During this time the contractor would ensure that all operational systems are functioning properly.

A permit to operate usually requires a successful test burn conducted under tightly controlled conditions using a known volume of

contaminated material with clearly established levels of contaminants.

During the test burn, air samples are taken from the stack continuously. Analytical results would confirm whether the incinerator had achieved the targeted PCB DRE of no less than 99.9999%. Also during this period the incinerator would be subjected to performance testing that would establish the standard operating procedures for the incinerator.

The incineration process includes primary combustion during which feed stock is burned at approximately 800°C or higher for a period of 20 to 40 minutes. The bottom ash generated from this process would be tested to see if successful decontamination has occurred.

The gases from the primary chamber flow into a secondary combustion chamber where they are subjected to temperatures of 1200°C for 1.8 to 2 seconds, which is normally long enough to destroy residual organic contaminants.

Gases and any remaining particulates would then cool down before entering the final stages of the air pollution control system. The gases would then exit from the top of the stack. STPA indicated that a pollution control system would likely include some combination of a bag house filter, wet scrubber or a cyclone. STPA told the Panel that it is not common to include all three types of pollution control mechanisms.

STPA would also require the selected incineration technology pollution control system to effectively remove dioxins and furans as well as volatile inorganic constituents such as mercury, arsenic and selenium.

Using computers, incinerator operators would monitor temperatures, feed rates, residence times, emission limits and other key

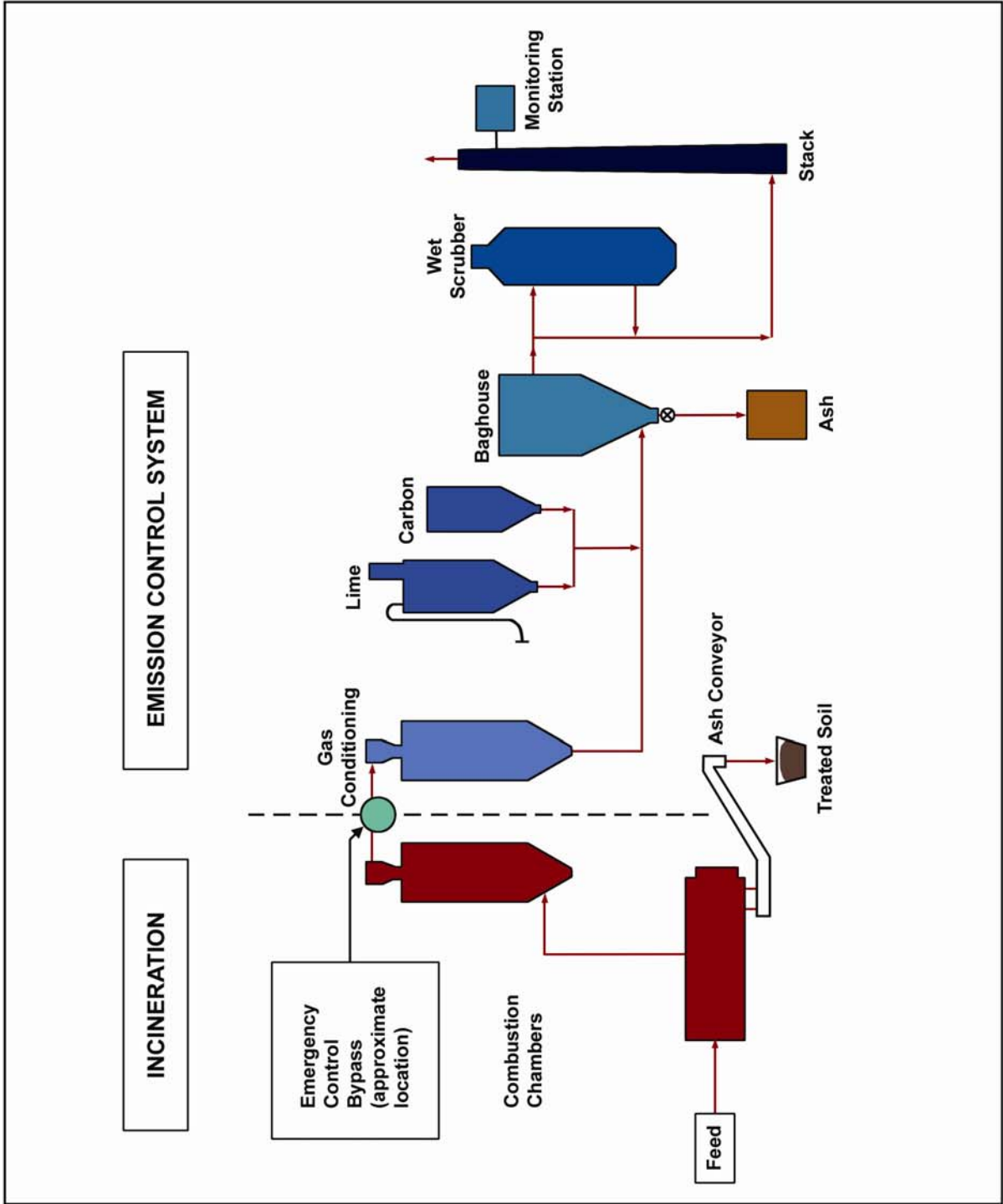


FIGURE 9
TEMPORARY
INCINERATOR
SIMPLIFIED FLOW
DIAGRAM

operating parameters. An automatic waste feed shutoff control would respond to unwanted events such as a) temperatures in the primary or secondary combustion chamber falling below approved levels; b) inadequate residence times; c) reduced oxygen concentrations in stack gases, and d) a loss of negative pressure in the primary combustion chamber.

A number of activities would generate contaminated water including:

- Precipitation contacting contaminated materials (even though under cover);
- Air pollution control scrubbing system (producing brine);
- Employee worker shower and laundry facilities; and
- Equipment decontamination.

STPA expects 63,100 litres of wastewater per day, including 28,300 litres from the wet scrubber. Contaminated water would be treated onsite and stored in two or three storage tanks before discharge.

Incineration residues include bottom ash from the primary combustion chamber and fly ash from the pollution control unit. Bottom ash would comprise 99% of the total and would be analyzed for PCBs, PAHs, metals, volatile organic compounds (VOCs), dioxins and furans to ensure regulatory requirements are met. The bottom ash would be used as blending material for incinerator feedstock or as backfill in the Tar Ponds.

STPA predicts a total volume of 66,000 tonnes of bottom ash that would be transported back to the Tar Ponds by rail, requiring one trainload a day. Fly ash would be transported by truck to a licensed hazardous waste disposal site.

During decommissioning any contaminated material such as gravel,

equipment that cannot be cost-effectively decontaminated, and contaminated water and air filters, would be incinerated before the incinerator is disassembled. Soil around the incinerator would be re-sampled to confirm if any contamination had occurred.

STPA proposes to develop a comprehensive monitoring program to verify compliance with municipal, provincial and federal regulatory requirements, and including:

- *Process monitoring* – Operating conditions such as minimum operating temperatures, maximum allowable feed rates, and proper functioning of automatic waste feed shutoffs would be continuously recorded through computer software and hardware;
- *Emissions monitoring* – Wastewater, incinerated materials and stack gases would be analyzed prior to removal or discharge; and
- *Environmental effects monitoring* – Ambient air, noise, soil, and water would be monitored to determine if any changes have taken place as a result of the incinerator operation.

In addition, STPA would monitor worker health including medical checks before, during and after completion of work.

5.2 AIR QUALITY AND HUMAN HEALTH

5.2.1 STPA Assessment

In 2005 STPA began monitoring ambient air quality in the two incinerator areas. Samples were collected at six locations including at the VJ and Phalen mine sites.

STPA used two air dispersion models to predict by how much airborne contaminants would increase within the incinerator's zone of influence.

STPA used data from meteorological stations Sydney Airport and at Yarmouth for upper air conditions and compared predicted maximum ground level concentrations of NO₂, SO₂, TSP and CO to the standards under the *Nova Scotia Environment Act*, and concluded that the incinerator would meet the majority of air quality standards during routine operations. The modeling predicted that SO₂ would exceed maximum permissible 24 hour and annual concentrations at ground level. However, this was based on the assumption that no pollution control devices were included. On the assumption that such a pollution control device would be installed on the incinerator, STPA predicted that SO₂ levels would fall to within acceptable limits.

However, there are other pollutants for which there are no applicable standards in Nova Scotia. These include VOCs, PAHs, acid gases, total hydrocarbons, metals, dioxins and furans, PCBs and chlorophenols. These contaminants are more significant from a health risk perspective than are the more common air quality parameters.

The air dispersion study noted that ground level contaminant concentrations could exceed regulatory limits in the event of an upset or malfunction during the operation of the incinerator. STPA assumed exceedances would be infrequent and last less than one minute. STPA would protect against this possibility through regular maintenance of the incinerator and monitoring. STPA predicted other relatively minor emissions relating to the transportation of incinerator materials by train or truck, or to dust generated during construction or decommissioning activities at the incinerator site.

Overall, STPA predicted that with mitigation no adverse residual effect on air quality would occur.

Human Health Risk Assessment

STPA used the results of the air dispersion modeling to conduct a Human Health Risk Assessment (HHRA). The risk assessment predicted both acute and chronic effects of incinerator operations on human health. The study estimated both carcinogenic and non-carcinogenic risks. Carcinogenic risks were evaluated over the total life span of an affected individual, while non carcinogenic risks were evaluated at different life stages (the toddler or the adult).

The risk assessment process involved four steps: hazard identification, toxicity assessment, exposure assessment, and risk characterization. Hazard identification for multiple pathway risk assessments requires data on emission rates for specific chemicals, and predicted air concentrations and deposition rates.

Toxicity assessment determines the relationship between the magnitude of exposure for each chemical of potential concern or dose and the specific health effects for a receptor or response. STPA attempted to obtain dose response criteria from Health Canada or the Atlantic PIRI. Failing this STPA used criteria from USEPA sources. Where no dose response information was available for a given chemical STPA substituted criteria for a structurally related compound.

Dispersion modeling produces predictions based on computerized mathematical dispersion models.

STPA identified potential routes of exposure for each receptor within a radius of 10 km from the incinerator, and carried out dispersion and deposition modeling for selected exposure areas. These included residential areas, water bodies where people may fish or swim, drinking water reservoirs and active farms or

agricultural land. Potential exposure pathways included breathing air, drinking water, or consuming food or fish.

Risk characterization combines the results of the exposure assessment and the toxicity assessment to determine quantitative estimates of risk of adverse health effects.

Carcinogenic risk is the likelihood, over and above the background cancer rate, that a person would develop cancer in his or her lifetime as a result of being exposed to chemicals originating from the incinerator. Excess lifetime cancer risks were calculated for each potentially carcinogenic compound, and then added for each receptor.

A carcinogenic risk was then determined to be significant, in line with Health Canada and Atlantic Canada PIRI standards, if it resulted in a chance that one in 100 thousand people would develop cancer over and above their background risk.

For non-carcinogenic risks, significance levels take into account whether background exposures are known and can be taken into account. If they cannot be calculated, the assumption is made that the Project would contribute 20% of a receptor's intake of a specific chemical. For the incinerator, STPA used the latter, more conservative approach.

Conclusions of the HHRA

STPA concluded through the HHRA that both carcinogenic and non-carcinogenic risks associated with incinerator emissions would be below significance levels.

STPA was confident that the assessment was based on many conservative or health protective assumptions, and that actual risks to residents, farmers and fishers living near the facility would be even lower than the risk

estimated by the HHRA, and therefore not significant. STPA maintained that this would be true even when long term exposure to deposited chemicals from the incinerator is evaluated long after the temporary incinerator is decommissioned.

The authors of the HHRA conceded that the human health risk assessment is highly dependent on the results of dispersion modeling. While the models are very effective in generating predicted values for concentration and deposition modeling, limitations on the availability of data may limit outputs from the dispersion model. To counter such limitations, STPA noted that the modeling assumed that the incinerator would run for 24 hours, 7 days a week, 365 days a year, for five years, thus overestimating likely emissions by a factor of at least three. This same cautious approach, STPA asserted, would help to offset the effects of uncertainty caused by the fact that the human health risk assessment was based on generic incinerator operating standards rather than a specific design..

The HHRA assumed that once a month the upset conditions at the incinerator would cause a temporary release of emissions at levels 10 times higher than under normal operating conditions, for a period of 30 minutes. These higher emission levels were added to the normal emission rates and still would not cause significant health effects.

STPA noted that VOCs were not evaluated as part of the HHRA because they would be destroyed during the burning process. Neither TPHs nor dimethylphenol were evaluated because no analytical data was available. However the HHRA did evaluate other PAH compounds that include the compounds of TPH that have the highest potential toxicity.

To support their conclusions in the HHRA, STPA compared predicted concentrations of selected chemicals to current baseline information. For example, in Grand Lake Brook trout were analysed for dioxins and furans. The results showed that predicted dioxin and furan effects from the incinerator would be 3,000 times lower than the levels presently detected in the Grand Lake fish. Similarly predicted mercury levels caused by incinerator emissions would be 12 times lower than levels presently detected in Grand Lake fish, and PCB levels 20,000 times lower. Despite the incremental increase of mercury in fish, the HHRA indicated that consumption of the fish by a toddler would pose a health risk. To reduce that risk to an acceptable level, the allowable concentration of mercury in incineration emissions was reduced from the criterion specified in national guidelines for the incineration of hazardous wastes to a value approximately 50 times lower.

Because the HHRA predicted that health risks for most substances from incinerator emissions were so low, STPA concluded that concentrations of chemicals for which analytical data were not available would not measurably increase after three years of incinerator operation.

To mitigate the effects of possible air emissions, STPA would maintain an efficient combustion process to provide maximum combustion efficiency, and install appropriate air pollution control system. STPA might also enclose at least the storage and treatment areas around the incinerator and possibly the incinerator itself.

During site clearing and construction of the incinerator air borne emissions may be created from the storage and handling of materials. Air emissions will also be created by the operation of heavy equipment as well as

dioxins and furans transportation and truck traffic.

5.2.2 Government and Public Concerns

Although Environment Canada concurred that modeling had been done correctly, they had a number of questions concerning use of weather data and differences between models. They observed that information about emission rates was unclear because of uncertainty regarding the number of incinerators to be used, feed rates and the type of pollution control equipment. Although concerned about information gaps, Environment Canada told the Panel that their concerns affected their comfort level but were not significant. However Environment Canada did insist that the air dispersion and risk assessment numbers should be remodelled once the final design details for the incinerator were known. They also suggested that this analysis should be reviewed by other stakeholders.

Health Canada were concerned that the HHRA had not evaluated the effects of particulate matter below 2.5 microns, and also about the lack of monitoring detail in the EIS. . They agreed with Environment Canada's assessment of the modeling and need for further work once detailed design information is available for the incinerator.

Other presenters also questioned the apparent vagueness of the information provided on the incinerator – the type and numbers of incinerator that would be used, its manufacturer and track record, the pollution control equipment to be used, the location of the thermal relief valve, and the daily throughput of feed stock (6 or 10 dry tonnes).

Some presenters questioned whether the air quality model had taken factors such as air inversions, the effects of cold weather on the incinerator plume, and the changeability of the

coastal climate into account. STPA confirmed that the modeling AERMOD addresses air inversion conditions, but also acknowledged added difficulties presented by winter conditions which could cause frozen and broken pipes and difficulties with the wet scrubber component. Some of these cold weather problems could be avoided if the incinerator did not operate during winter months. STPA also indicated that the detailed engineering phase of the Project would address winter weather problems. STPA did not consider coastal wind effects to be significant.

Responding to Environment Canada's concerns about the consistency of dispersion modeling, STPA explained that the VJ site and the Tar Ponds and Coke Oven sites required different values because of their urban / rural differences.

STPA explained that they were confident from past experience about the validity of using Yarmouth weather data for upper air layers, especially given the lack of any closer data set.

With respect to the use of generic incinerator information for modelling, STPA emphasized the very conservative nature of the modeling assumptions used and how this would result in predicted emissions being significantly overestimated. STPA also explained that it was possible to model emissions from a generic incinerator by assuming that all regulatory emission limits would be met. STPA argued that the purpose of the EIS is not to design equipment but rather to assess the impact of proven technology that meets the standards set by appropriate regulatory agencies. The selection of the successful contractor will include a review of the design and performance of the equipment.

Several presenters raised questions about mercury emissions and STPA's HHRA derived

criterion for mercury. The Panel questioned why the Canada wide standard was not used and whether the new, more stringent standard could be met. Nova Scotia Department of Environment and Labour asked why the standard for mercury was not discussed and the Nova Scotia Department of Natural Resources asked how much mercury would be released into the environment.

STPA explained that because of existing baseline levels of mercury in the local environment, and because of the conservative nature of the risk assessment protocols being followed, STPA has adopted a mercury emissions standard roughly one fiftieth of the new *Canada-Wide Standard* (1.1 ug of mercury per Rm3. compared to 50 ug of mercury per Rm3). While this lower level is not required to protect human health, emission control technology is now available that can meet this standard.

As a further risk margin, STPA explained that risk management calculations showed that the incinerator could emit mercury at levels 100 times higher than the levels assumed in the EIS for a total of more than 17 hours a year without increasing the non-carcinogenic health risks beyond limits set by Health Canada.

Health was the biggest concern raised by many community presenters. Presenters questioned the adequacy of the human health risk assessment methodology, the possibility of an incinerator explosion or less serious malfunction resulting in the release of uncontrolled gases, lack of epidemiological studies, lack of adequate monitoring for dioxins and furans, and the incinerator siting process..

One presenter told the Panel that human health risk assessment is a crucial component of the Panel's ability to assess the effect of the incinerator upon human health. Health risk

assessment was criticized at the hearings as a “pseudo-science” often substituted for common sense and used as a rhetorical device to produce desired results. To support the position that human health risk assessment was inaccurate, the Panel was referred to a British study that claimed that air dispersion modelling has a 30% confidence level and that epidemiological data shows that incinerators are not safe.

Some presenters expressed a general distrust or scepticism about modeling.

Specific human health concerns included:

- The most sensitive receptor chosen for predictions should have been a foetus rather than a toddler living on a nearby farm;
- The frequency, duration and effect of upset conditions were underestimated;
- Emission releases were overly optimistic;
- The HHRA should have considered existing body burdens of dioxins in the population, not just incremental effects;
- The human health risk assessment used an out of date cancer slope factor for dioxins;
- The assessment did not take into account the possibility of a major incinerator accident; and
- The EIS Guidelines appeared to require not just a risk assessment but a health assessment that would provide baseline data through an epidemiological study.

Health Canada expressed support for the conclusions of the risk assessment based on the methodology used and was generally satisfied with the mitigative measures outlined in the EIS. The department emphasized that STPA should ensure the protection of the area residents through the following measures:

- The incinerator must meet all the conditions and operating permits including meeting all standards for emissions;
- Workers should be properly trained to operate and monitor the facility;
- Proper protocol should be put in-place for malfunctions and upsets;
- Ensuring a quick response to any detected exceedances;
- Environmental monitoring of fish, berries, garden produce and air (including chemicals of concern such as mercury, PCBs, dioxins, furans and PAHs) is needed to validate the conclusions of the modeling and risk assessment and ensure that the surrounding environment is not being impacted.

Health Canada also recommended that a monitoring program be put in-place to track pre and post-construction levels of contaminants of concern in country foods.

The Nova Scotia Department of the Environment suggested that details regarding the actual incinerator would be worked out during the approval process at a later date.

The Cape Breton Health District concluded that the human health risk studies were indeed scientifically based and conservative in their predictions.

Some presenters told the Panel that it is possible to continuously monitor the emissions of dioxins and furans at the main stack, using new monitoring technologies available in Europe and they expressed concern that this was not part of the continuous emission monitoring program proposed by STPA.

CCME Setback Guidelines

CCME Guidelines suggest a setback of 1500 meters for fixed, permanent hazardous waste incinerators. However, based on the assumption that the facility is a mobile, temporary hazardous waste incinerator, STPA proposed a separation or setback distance of 500 meters around the incinerator facility as a protective health measure. STPA explained that they took the Ontario mobile incinerator regulation setback of 250 meters and doubled it to give added protection to nearby residents.

Mobile PCB regulations under CEPA apply only to incinerators operated on federal lands or operated under contract to the federal government. If the incinerator were to be located upon provincial lands, it would be governed by provincial law. At this time there are no mobile incineration regulations governing such a situation. However, there are national guidelines agreed upon by both federal and provincial governments. Regardless of the availability of regulations governing mobile PCB incinerators, the Panel was advised by representatives of both provincial and federal agencies that these guidelines would apply to the Project.

Residents of the Grand Lake area, in particular, expressed concern and disappointment that the CCME Guidelines and setback distance were not being applied because they were believed that federal government officials had promised the community that CCME Guidelines would be applied. They pointed out that there are 20 homes and one dairy farm within the 1500 meter range.

STPA explained that while setbacks are important, the conditions imposed by regulators would be equally important. They suggested that at the design phase proximity to residents would be considered and could affect the extent of the pollution control equipment required and

the type of monitoring. Environment Canada noted that the 1500 meter setback was somewhat arbitrary and that site-specific air emission dispersion modeling and risk assessment could effectively determine safe setback distances. Environment Canada indicated that CCME Guidelines are out of date, and endorsed STPA's use of modeling and risk assessment to establish separation distances.

In response to public comments, STPA pointed out that human health risk assessment had been performed for many decades and were recognized and accepted as useful procedure for predicting health impacts. STPA concluded that there was very little scientific literature to support the claim that adverse health effects had been repeatedly documented in people who live close to incinerators of any type.

With regard to the selection of the most sensitive receptor, STPA explained that the Human Health Risk Assessment Protocol for Hazard Waste Combustors (EPA 2005) does not have methods and procedures for evaluating risks to developing fetuses. Nevertheless STPA calculated that, conservatively assuming that the worst case total dose to a foetus would be equal to 100% of the dose ingested by the mother over the course of three years, their calculations showed that the total body burden of dioxins and furans in the new born infant would be thirty seven times lower than the Tolerable Daily Dose established by Health Canada..

With regard to the allegation that the HHRA was deficient because it did not use a Draft Cancer Slope Factor for Dioxins and Furans that is currently undergoing debate in the United States by the National Academy of Sciences, STPA indicated that they followed Health Canada's guidance on this issue and used both the Canada Health Tolerable Daily Dose and the current US EPA Cancer Slope Factor.

Responding to concerns about continuous monitoring of dioxin emissions, STPA pointed out that the technologies referred to by the interveners were samplers and not analyzers. While these devices may operate continuously by absorbing contaminants in a filter material, the sample still had to be sent to a laboratory for analysis. This would not constitute continuous monitoring, and while the technology could provide useful information and reassurance for the public, it could not analyze at a detection level low enough to satisfy Canadian federal regulators. STPA did undertake to look at the technology referred to by the interveners.

5.2.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

The Panel recognizes that the public is primarily concerned that the incinerator could cause degrade air quality and cause adverse health risks. STPA's human health risk assessment indicated that effects on health would be minimal. The Panel understands public concerns with the use of modeling, but believes that the modeling carried out by STPA was based on scientific principles and is an essential requirement of environmental assessment in order to predict incinerator impacts. The Panel also concludes that the HHRA and subsequent information provided at the hearings adequately addressed the situation of the most sensitive receptor, and also the use of an appropriate cancer slope factor. The Panel agrees with Environment Canada and Health Canada that STPA adopted a conservative approach in its modeling assumptions that provided an acceptable margin of error. Recognizing that the modeling occurred before STPA's selection of the final incinerator technology, the Panel agrees with Environment Canada and others that predictions should be remodelled once the specific incinerator type has been determined.

The Panel has reviewed the paper provided to it criticizing modelling as being accurate only accurate 30% of the time. The Panel notes the claim in the paper is unsupported. STPA provided a detailed response to the claim that epidemiological data shows that incinerators are not safe. Its conclusion was "one cannot conclude that there are absolutely no epidemiology studies showing adverse effects in communities around incinerators, one can conclude that there are more negative studies than positive ones, and the evidence from the few positive studies is weak." The Panel agrees with this conclusion. While there may be a lack of hard evidence of health effects in the community the Swan Hills studies have made the Panel aware that the risks of incineration are real and that precautionary measures are required. The Panel believes its recommendations, together with the measures proposed by STPA, will ensure health risks to the community will be minimized.

There is no discussion in the EIS as to which type of incinerator would be best suited for the needs of the Project. STPA left the question unresolved but air quality modeling and the HHRA both appeared to assume use of a rotary type incinerator. The issue was not raised at the hearings and the Panel has no basis for favouring one technology over the other. Historical use appears to show a preference at least in United States for the rotary kiln type but this decision remains to be one that STPA will have to make at the final design stage of the Project. In terms of adverse effect on the environment, the Panel can see no distinction between the two types of incinerators.

Recommendation # 20

Air Dispersion Modelling & Risk Assessment

The Panel recommends that NSEL and PWGSC require STPA to conduct

additional dispersion and risk assessment modeling once the number of incinerators and details of the incinerator design are finalized to confirm the predictions presented in the EIS. This analysis should be provided to Environment Canada, Health Canada, and NSEL for review and comment.

The Panel has considered the recommendation that STPA should conduct a baseline epidemiological study. However the Panel has concluded that the environmental assessment guidelines for this Project do not require that such a study be carried out as well as the health risk assessment. Although useful in establishing baseline health data, the Panel considers that such studies are expensive, difficult to administer, and in most cases unable to connect health effects to particular activities.

The Panel observes that pollution control equipment would prevent the emission of the majority of contaminants but that some will still escape to the surrounding environment. Air dispersion modeling has predicted that routine operation of the facility will meet the majority of air quality standards for the contaminants modeled at both sites. In the case of upsets, air modeling predicted that exceedances, which would be infrequent and short term in nature lasting less than a minute, would have no significant effect on human or environmental health. Planned protection against such events includes stringent monitoring and maintenance operations. While the Panel was not convinced, by information provided by STPA that all upset conditions would necessarily last for less than a minute, the Panel believes that the conservative assumptions built into the health risk assessment offer a sufficient margin of safety.

The Panel believes that the Project should provide the maximum degree of protection by employing state of the art technology to reduce emissions of dioxins and furans to a minimum. Given continuing public

concern with this issue and the historical legacy of dissatisfaction and disappointment with earlier incinerator operations, the Panel believes that every effort should be made to reduce risks, even though they have been assessed to be insignificant, posed by incinerator emissions.

The Panel is unsure whether true continuous emission monitoring for dioxins and furans in real time is technically possible, and acknowledges that STPA has undertaken to investigate this issue. The Panel concludes that the Project should employ the best possible monitoring technology for this family of compounds, combined with frequent public reporting.

The Panel concurs with the assessment methodology and mitigation measures proposed by STPA but believes that the final design of the incinerator and its emission criteria must rely on more than risk assessment and regulatory compliance. The proposed incinerator is intended to destroy PCBs. It will also be a source of unintentionally produced PCBs, dioxins and furans, and hexachlorobenzene. The Stockholm Convention identifies waste incinerators as a source of such pollution and provides guidance on the goal of minimization and, where feasible, ultimate elimination of PCBs, dioxins and furans, and hexachlorobenzene. To achieve the goal, the convention advocates implementing the guiding principles of “best available techniques” and “best environmental practices”, both of which are defined by the convention. The convention provides guidance on use of best available techniques which includes giving special consideration to a number of factors including “the need to prevent or reduce to a minimum the overall impact of the releases to the environment” and “technological advances and changes in scientific knowledge and understanding.”

The Panel believes that, with respect to incineration and emissions of PCBs, dioxins and furans, and hexachlorobenzene, pollution prevention is the guiding principle that must complement the other development criteria of regulatory compliance and risk management. The Panel is aware of the conservative nature of both the emissions criteria relevant to incineration and the risk assessment process. It is prepared to concede that on a practical basis adopting the principle of pollution prevention may result in no meaningful changes to the Project. Nevertheless, the Panel is concerned that the mercury regulatory criterion proposed initially for the incinerator was subsequently reduced by a factor of almost 50 and that STPA and at least one of the possible regulators are confident that the limit is technically achievable. With that information the Panel is left with the question “Have technological advances and changes in scientific knowledge and understanding rendered the national criterion for mercury out of date?” The same question must be asked of incinerator emissions criteria for PCBs, dioxins and furans, and hexachlorobenzene.

The Panel is unsure whether true continuous emission monitoring for dioxins and furans in real time is technically possible and acknowledges that STPA has undertaken to investigate this issue. Regardless of its availability the Panel concludes that the Project should employ best available techniques and best environmental practices in the monitoring for PCBs, dioxins and furans, and hexachlorobenzene.

Recommendation # 21

Pollution Control and Monitoring Technology

The Panel recommends that:

- **EC and NSEL develop criteria for PCBs, dioxins and furans, and hexachlorobenzene in incinerator emissions incorporating the principle of best available techniques as it is defined by the Stockholm Convention;**
- **NSEL use the developed criteria in the drafting of regulatory approvals for incineration; and**
- **NSEL require STPA to identify and use best available technologies and best environmental practices when monitoring air emissions of PCBs, dioxins and furans, and hexachlorobenzene from the incinerator.**

The Panel heard concerns about the potential for fugitive emissions from the incinerator and notes that these can be difficult to monitor from an unenclosed facility. The Panel observes that STPA has not indicated that the entire operation would be enclosed but has shown this as a possible mitigation measure. The Panel was told by the operator of a new incinerator in New Brunswick that their facility was totally enclosed. In order to reduce risks of fugitive emissions, address public concerns that unmonitored emission could be occurring, and ensure that the temporary incinerator employs the same mitigation usually required for a permanent facility, the Panel concludes that the entire facility should be enclosed.

Recommendation # 22

Enclosure of Incinerator Facilities

The Panel recommends that STPA be required by NSEL and PWGSC to enclose the incinerator and all ancillary storage areas for feedstock, bottom ash and fly ash in order to capture and monitor any fugitive emissions and to prevent adverse weather effects.

5.3 GROUNDWATER RESOURCES AND SURFACE WATER RESOURCES

5.3.1 STPA Assessment

Groundwater

The VJ site has, in the past, obtained its water supply from an onsite well field. Four other nearby well fields service non residential facilities. All residential properties located some 1.5 kilometres to the north along Lingan Road and 1.3 kilometres to the south along the Sydney Glace Bay highway are on individual groundwater supplies.

Groundwater at the VJ site is contaminated by acid drainage from the coarse rock waste pile. CBDC, the landowners, are currently remediating the site. This involves a groundwater pump and treatment system and a cover cap for the waste pile. Remedial action plans are being formulated for the rest of the site.

STPA indicated that acid drainage impacts affect adjacent wetlands. Northwest Brook continues to be affected by runoff from the VJ site and acid seepage. The VJ site exhibits exceedances of metals and organics in both soil, and groundwater.

At the Phalen site limited hydrogeological work has been undertaken because mining operations are under the sea. There is one industrial production well located 1 kilometre east of Phalen Mine site at the NSPI Power Plant. In addition, there are a number of domestic wells located approximately 600 meters southwest of the site.

A limited amount of information is currently available regarding the existence of any contaminated plumes within the groundwater flow fields at the Phalen site. Given the presence of above grade acid

generating coarse waste stone dumps from previous mining operations at both Lingan and Phalen Mines some contamination is quite possible.

The nearby MacLellan Height subdivision draws its water through individual wells. The subdivision is situated upwind from the proposed incinerator site. This fact, plus the presence of a suitable till cover, is expected to minimize the impact of any fugitive emissions on the water supply aquifer.

STPA anticipates that any potential adverse effects of incineration on groundwater caused by dust deposition and subsequent leaching would be counteracted by a number of factors. These include the effective destruction of PCBs and other organics in the incinerator, compliance with established air emission levels, effective operation of the existing water collection and treatment systems at the VJ site and the presence of till over the bedrock. STPA indicated that there would therefore be minimal adverse effects upon the groundwater or on Northwest Brook at the VJ site.

The incinerator at the VJ site will obtain its water supply from a well on site. Water will be required for the operation of the incinerator, soil processing decontamination, and other activities. STPA indicated that the volume of water requiring treatment will not be substantial and that effects on existing wells in the area would not be significant.

Water at the Phalen site would be obtained through the town of New Waterford's surface water system. Again, STPA stated that the impact on the existing demand would not be significant.

Surface Water

Runoff from the incinerator stock piles, ash piles and other stored materials, if not

adequately controlled, may contribute further contamination of Northwest Brook. Mitigation will include standard containment of these potential pollution sources and strict materials handling requirements outlined in the EMP. At the implementation of the recommended mitigation measures, the residual environmental effects of plant Project components on freshwater habitat that biota are evaluated is not significant.

STPA carried out water and sediment quality sampling at the VJ site, including Northwest Brook, Grand Lake and Browns Lake, in 2005. Sediments of Grand Lake were found to have elevated PAHs and levels of dioxins and furans toxic in excess of CCME sediment quality guidelines.

In Northwest Brook, samples indicated elevated concentrations of naphthalene, and exceedances of CCME guidelines for arsenic and chromium.

Grand Lake is a receiving water body for some of the drainage from the VJ site. Brook trout and gaspereau were tested for PCBs, PAHs, metals and mercury in 2005 as part of a sampling program. Mercury in the brook trout exceeded CCME guidelines for both body and offal tissues. Some results also exceeded Health Canada's guideline of 0.5 mg/kg for mercury in commercial fish. A mercury advisory for Grand Lake was implemented by Nova Scotia Departments of Health, and Environment and Labour in 2005.

While PAHs were not detected in any of the Grand Lake trout either in body tissue or offal some samples indicated the presence of PCBs.

Phalen Mine Site

STPA carried out sampling in 2005 in Waterford Lake, upstream of the potential

incinerator site, as well as at Graces Brook and Irish Brook. Water resources in and around the Phalen Mine site have been affected by industrial activity in the area and showed elevated levels of aluminium and other metals. Sediments from Waterford Lake, Irish Brook and Graces Brook indicated dioxin and furans levels significantly higher than the CCME interim sediment quality guideline of 0.85 ng/kg.

STPA expects that Waterford Lake and Irish Brook would be unaffected by drainage at Phalen since they are both upstream.

Water at the Phalen site would be supplied through the town of New Waterford's surface water system. If emission guidelines are met throughout the operation, STPA anticipates that no significant residual effects are likely. This would be substantiated through monitoring.

An existing water collection and treatment system at Phalen would be used to treat wastewater, and again STPA predicts minimal effects on surface water in the area.

The concern for the freshwater environment stems from the deposition of and subsequent uptake of PCBs, PAHs and metals by a variety of biotic receptors. STPA conducted an ecological risk assessment (ERA) to determine what risk incinerator emissions pose to such receptors. The ERA predicted total accumulative depositions wet and dry over a period of five years, and concluded that the incremental risk from the incinerator for aquatic receptors was negligible and almost imperceptible above contributions from existing atmospheric sources for both incinerator sites.

5.3.2 Government and Public Concerns

Government Concerns

NSEL expressed concern that the temporary storage of contaminated soil might have a negative impact on groundwater. Because the VJ site is located in an area that is not serviced by municipal water, protection of groundwater is particularly important. While previous industrial operations have already contaminated groundwater, NSEL stressed the need to make sure that the contamination does not become worse.

NSEL noted that the feedstock storage area would be on a concrete pad with a surface water runoff collection system. NSEL suggested that the concrete pad be designed so that it will not leak or develop major cracks over the lifetime of the Project and that, additionally, a monitoring program be put in-place to periodically assess its integrity. In addition, a groundwater monitoring program should be implemented to confirm that the concrete pad is effectively preventing groundwater contamination.

Environment Canada asked that STPA provide details of their proposed freshwater and aquatic monitoring program to determine the anticipated effects of emissions from the incinerator.

Public Comments

Intervenors at the hearing expressed concerns with the effects of possible incinerator fall out on Grand Lake and other lakes within the vicinity of the VJ site. Grand Lake is of particular concern because it is considered to be a potential water supply source. There is also a concern with possible effects of the incinerator upon recreational fishing activities in the vicinity of the VJ site.

Presenters expressed concerns about the effects of incinerator emissions on the quality of the water in Kilkenny Lake which is used to supplement the water supply in Waterford Lake. The latter provides drinking water to the town of New Waterford.

A local fish and game association provided the Panel with a history their involvement with the past industrial development of the VJ site and related contamination problems. The participant provided his opinions of his organization on the lack of credibility of government and their consultants with respect to environmental protection. The association was critical of STPA consultation program believing that legitimate stakeholders were excluded.

5.3.3 Panel Conclusions and Recommendations

Because no interactions between incinerator operations and groundwater are predicted, STPA foresees no residual environmental effects. The Panel agrees in relation to contamination but is less confident about the impact upon the well water supplies particularly at the VJ site. STPA has already supplied the Panel with water usage figures that show a maximum of 615,000 litres per day. The Panel therefore recommends close monitoring.

Recommendation # 23

Effects on Wells at the VJ Site

The Panel recommends that NSEL and PWGSC require STPA to monitor the affect of Project water usage at the VJ site on the underlying aquifer and on private wells drawing from the aquifer, and to develop an appropriate mitigation plan should adverse effects be identified.

With regard to surface water, the Panel notes that a major concern for the freshwater environment stems from the deposition of and subsequent uptake of PCBs, PAHs, and metals generated by the operation of the incinerator. Atmospheric emissions could increase contaminant levels in lakes in the vicinity of the facility. STPA has concluded that the operation of an incinerator at either site would have a negligible effect on the aquatic environment, which would be imperceptible above contributions from the existing atmospheric sources. As a result, STPA proposes no specific mitigation measures for freshwater impacts. The Panel agrees with STPA's conclusion but reemphasizes that risks should be minimized by adopting the principle of best available techniques in the selection of pollution controls. The Panel also concludes that because of the importance of Grand Lake, Kilkenny Lake and Browns Lake as part of a water supply system and as an area of recreational fishing, STPA must follow best environmental practices in monitoring the effects of incineration on surface water bodies and aquatic resources.

Recommendation # 24

Monitoring of Surface Water Resources

The Panel recommends that NSEL and PWGSC require STPA to monitor the environmental effects of incinerator operations on surface water bodies and aquatic resources. Monitoring techniques should employ best environmental practices and results reported to the public and to the operators of local water supply systems.

STPA expects that the existing groundwater collection system will minimize effects to Northwest Brook. Because this stream is an important aquatic resource, STPA plans to install stream monitoring stations. The Panel agrees and recommends the suggested monitoring studies be implemented. Effective

pollution control systems from the incinerator should help ensure that emission guidelines are met and no significant residual effects occur. Environmental effects monitoring should substantiate this expectation.

Water at the Phalen site would be obtained through the town of New Waterford's surface water system. STPA believes that the impact on this system would not be significant. However the incinerator's projected water usage is considerable and the Panel concludes that STPA should confirm the significance of impacts of the Project on New Waterford's water supply before Project approvals are granted.

Recommendation # 25

Phalen Site Water Supply

Should an incinerator be sited at Phalen, the Panel recommends that NSEL and PWGSC require STPA to consult with CBRM and confirm that the municipality will be able to supply the required volume of water.

5.4 SOIL QUALITY

5.4.1 STPA Assessment

Both potential locations are within former industrial sites with extensive pavement areas. As a result, disturbance of native soils would be minimal insofar as site preparation is concerned. STPA has not identified any adverse effects with respect to the development of infrastructure and assembly of the incinerator.

STPA conceded there is a potential for deposition of particulates on soils within the vicinity of the incinerator. These potential effects have been analysed through risk assessment for ecological and human receptors. STPA predicts no risk to these receptors if mitigation measures are implemented, including

the use of appropriate environmental controls on the incinerator facilities and proper operation and maintenance of the facilities and appropriate emission monitoring.

5.4.2 Panel Conclusions

The Panel agrees that direct effects on soil resulting from the operation of the incinerator will be minimal mitigation measures are implemented.

STPA indicates that deposition on soil during the operational phase of the incinerator would be minimized by the proposed mitigation measures including: appropriate environmental controls, effective operation and maintenance, emissions monitoring, and baseline soil analysis from the site and potential deposition areas.

The Panel agrees with these mitigation measures and again emphasizes the requirement to minimize the release of airborne contaminants through application of best available emissions control techniques.

5.5 TERRESTRIAL WILDLIFE & VEGETATION

5.5.1 STPA Assessment

Terrestrial Environment

STPA conducted field studies at both the VJ and Phalen Mine sites. Environmental data was collected on species at risk (both plants and wildlife) vegetation and habitat, migratory birds, and any other environmental components relevant for the effects assessment.

Victoria Junction Site

As a former coal preparation facility, the site is largely without vegetation. There is a large asphalt paved area formerly used to sort coal that is not a suitable habitat for any species.

Two areas on the site could provide habitat for small mammals. One is composed of grasses, shrubs and herbaceous plants while the other is a semi wetland within 1 kilometre of the site.

Phalen Site

The Phalen site is a former coal mine. Currently mine waste and field waste from the nearby coal-fired power plant is being stored and a plan for long term storage is being implemented. There is no vegetation within the proposed incinerator site boundary which was formerly an outdoor storage area for the former mine and is composed of bare ground and crushed rock.

Terrestrial habitats that generally occur within 1 km of the site include:

- Bog and wetland;
- Shallow marsh wetland;
- Coastal heath land;
- Immature to mature forest and pasture on former cleared areas related to past mining activities; and
- Other highly disturbed or residential areas.

Habitat Loss and Wildlife

Habitat loss at the incinerator site is expected to by STPA to be negligible. This is because the construction of the incinerator will take place within a small area what has been previously a large developed disturbed industrial site with little suitable habitat. Highly disturbed areas tend to generate only low shrubs and herbaceous plants to provide some habitat for nesting migratory birds. During site clearance there is some potential to effect ground nesting migratory birds. Because of this, STPA plans to avoid site clearing during the period April 15 to August 15.

STPA acknowledges that during start-up and shut down periods the level of unwanted emissions could rise above normal limits. However STPA expects that the concentration of noxious chemicals in emissions will not exceed provincial standards at any time. The Proponent points out that there is a possibility that wildlife might be affected by the operation of the incinerator through disposition by air emissions and that this was considered as part of the ecological risk assessment. These results indicated that there would be no significant effects on vegetation or wildlife from incinerator emissions.

Species at Risk and Species of Conservation Concern

STPA was required to identify all species at risk or of concern that may use critical habitat at or near Project sites. Species at risk include all species listed in the *Nova Scotia Endangered Species Act* and species listed in Schedule 1 under the *Canadian Species at Risk Act* (SARA). Species of conservation concern are those that have been ranked in the provincial General Status ranks of Wild Species in Nova Scotia.

STPA obtained a list of species at risk and known to exist within 10 kilometres of the Project from the Atlantic Canada Conservation Data Centre. Surveys were conducted at the VJ and Phalen sites in June and again in August of 2005. Suitable habitat exists within the Project area it is assumed that the species identified are likely to be present.

The boundaries of terrestrial wildlife and vegetation were considered to be all naturally vegetated areas within the Project's boundaries and all naturally vegetated areas within 1 km of the incinerator site. The 1 km was considered the maximum extent to which measurable effects on wildlife could be reasonably expected to result from Project works and activities.

No species at risk were identified within the Project site boundaries. One species of conservation concern that was identified during the 2005 field surveys in close proximity to the proposed incinerator site was the bulbous rush. This species is considered to be sensitive to human activities. It is very uncommon in Nova Scotia and has a known affinity for sites with high iron concentrations and low pH. It is particularly abundant downstream of the waste pile location indicating that has flourished partly because of the acid mine drainage emanating from the waste into Northwest Brook. It is not expected to be harmed by Project activities.

As the ERA found that no species at risk or plant species of special concern were present within the boundaries of the incinerator site, no mitigation measures were required. The bulbous rush exists in habitat close to the VJ site but outside the designated boundary of 1 km, which is the maximum extent to which measurable effects on wildlife and vegetation could be reasonably expected to result.

The EIS concluded that there was no significant threat to species at risk and species of conservation concern.

5.5.2 Government and Public Concerns

The Nova Scotia Department of Natural Resources told the Panel that the 1 kilometre radius is not sufficiently wide to protect some species of vegetation such as the boreal felt lichen, which is considered, endangered and sensitive to airborne pollutants. The Department suggested that the geographical area for analysis for all species listed as red, yellow, undetermined or with formal protection under SARA and NSESA be extended to one hundred kilometres.

5.5.3 Panel Conclusions

The Panel agrees with STPA's conclusions providing mitigation measures are implemented STPA conceded that clearing terrestrial vegetation at the incinerator site could affect nesting migratory birds, particularly ground nesters. To minimize this possibility STPA suggests that clearing activities avoid the period between April 15 and August 15. The Panel agrees with this suggestion

While the Panel recognizes the legitimacy of the concern with lichens it also recognizes the short duration of incineration activities, the scale of the operation, and the Project's requirements for emissions controls. The Panel agrees with STPA's conclusion on the risk to species of conservation concern.

5.6 MARINE ENVIRONMENT

STPA position on the effects of incineration on the marine environment is that Sydney Harbour will not be influenced by deposition from the incinerator at the VJ site and that if an incinerator is located at the Phalen the incremental chemical concentrations deposited in the ocean will not be noticeable in the high-energy marine environment, and will not be discussed further.

Effects on the marine environment from incineration received little attention from government or the public during the assessment.

The Panel concludes that given already identified mitigation measures and its own recommendations, incineration activities are unlikely to have any significant adverse effects on the marine environment.

5.7 EFFECTS ON THE CAPACITY OF RENEWABLE RESOURCES

The EIS has already identified the utilization of fish species in the incineration areas is compromised by mercury contamination. The human health risk assessment has identified that the Project will contribute to the existing problem. STPA has addressed this issue by lowering the identified emission criterion for mercury. The Panel believes the mercury in fish is the only potentially significant adverse effect of incineration on the capacity of renewable resources to meet the needs of the present and those of the future. The Panel concludes that, with STPA's identified mitigation, the effect is not likely to be significant.

5.8 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

5.8.1 STPA Assessment

Four environmental conditions were identified in the EIS that could affect the incinerator: severe weather, flooding, seismic events and climate change.

Severe Weather

Severe weather conditions include high winds (tornados and hurricanes), severe rainfall, ice storms and thunderstorms. Severe weather has been identified as having the potential to interact with several Project components, including the incinerator during all applicable Project phases. STPA stated that all structures including the incinerator structure itself would be constructed to withstand hurricane force winds. In case of doubt, buildings would be temporarily dismantled or otherwise secured during this type of event so as not to pose a risk.

Even though labelled a mobile incinerator the facility is still a heavy structure

and should be able to withstand heavy winds. The increasing occurrence of hurricanes on the eastern seaboard does however make this element more of a factor in recent years and worthy of close consideration.

Flooding

STPA had reviewed both the preferred site (former VJ coal preparation plant) and the alternate site (Phalen Mine site) with respect to potential flooding issues. Both sites are considered to be outside the area of any potential flooding. STPA stated that final siting of the facilities within these properties would eliminate any concern for flooding. The Panel agrees with this assessment.

Heavy rain could lead to contaminants being washed out of the open storage areas during commissioning, which could occur at the end of the construction phase. However STPA plans to have storage areas under cover. This should prevent any significant run off from occurring.

Seismic Events

Although seismic activity on the eastern American seaboard is common, the majority of shocks are very small. Earthquakes in Atlantic Canada have all had magnitudes of less than 5.2 on the Richter scale, except the Grand Banks earthquake in 1929 with the magnitude of 7.2.

Because of the location of the Project, there is only a one in a hundred chance each year of experiencing minor to moderate damage from seismic activity. STPA stated would conform to Canadian building codes and be built with potential seismic activities in mind. As a result no interaction with seismic events is predicted and there would be no effects on the proposed structure or activities.

Climate Change

Climate change is taken into consideration in this environmental assessment because of its influence on the frequency and severity of weather events such as hurricanes and rainfalls. It can also have an effect on sea level rise and increased flood levels. It is a natural phenomenon that is accelerated by manmade activities.

STPA indicated that Natural Resources Canada predicts temperature increases of 3 to 4 degrees for the Atlantic Region together with changes in precipitation patterns. An increase in extreme events, including storm surges, which may result in water levels rising by a meter or more above normal, are also predicted. Sea level rises of as high as 70 centimetres are expected

Because of the relatively short construction and operation period involved STPA does not foresee climate changes having any significant effect upon the Project as a whole or the incinerator in particular.

Forest Fires

Forest fires do occur in Nova Scotia and in Cape Breton but the amount of yearly precipitation means that historically forest fires have not been a major concern. This aspect of the environment was not discussed in the EIS or raised as an issue at the hearings.

5.8.2 Government and Public Concerns

Except for concerns about the effect of coastal winds, weather inversions and general winter conditions upon the incinerator's emission plume, there was little concern expressed about the effect of the environment upon the incinerator. There was a passing reference to the possibility of an incinerator being struck by lightning but this was not made in the context

of severe weather around either the VJ site or the Phalen site.

5.8.3 Panel Conclusions

Overall the Panel is satisfied that the effects of the environment on the incinerator its operations would be minimal. The most significant effect could be from severe weather associated with hurricanes, the prevalence of which is increasing. However, if the incinerator and supporting buildings are erected with this potential risk in mind and constructed accordingly, effects should not be significant. STPA has acknowledged the need to educate operators on the need for winterizing and has committed to address the requirement as part of the detailed design.

5.9 ACCIDENTS AND MALFUNCTIONS

5.9.1 STPA Assessment

In the EIS STPA addresses incinerator malfunctions and accidents that are deemed to have a reasonable probability of occurring. They did not address all conceivable abnormal occurrences. Credible events considered by the EIS include the possibility of combustion related failures in the incineration process itself, as well as a failure of some portion of the emission control system including the computers.

STPA indicated that most of the potential upset conditions occur in the pollution control system rather than in the combustion zones. Sediment or sludge that has passed through two combustion chambers will have had most of its hazardous organic constituents removed if the incinerator is operating to permit requirements. The remaining acid gases and particulate matter then have to pass through the pollution control apparatus. If this is not operational, the incinerator would be subjected to a controlled shut down and the gases from the

combustion chamber would be released through a thermal relief valve. Because these gases have not been cooled in the quench tower, the gas plume would be in excess of 1,000°C and would rise rapidly due to thermal buoyancy. STPA therefore concluded that such releases would not significantly affect ground level concentrations. STPA also stated that the duration for this type of event would likely to be under a minute because of continuous emissions monitoring, and operating procedures and policies.

As a result, the release of emissions that exceed acceptable levels would be limited in time and also limited to the immediate surroundings of the incinerator. STPA therefore does not expect any significant adverse effects on the soil, surface water or groundwater VECs.

Another possible event includes off site traffic accidents involving vehicles or railcars used to haul contaminated materials to the incinerator. The most critical areas would be immediately adjacent to Grand Lake STPA indicated that emergency spill clean up packages would be provided in areas adjacent to the rail line to improve response times.

STPA concludes that with the implementation of mitigation, health and safety provisions and monitoring programs, effects of malfunctions and accidents are expected to be of small magnitude and duration, localized and reversible. Residual effects are expected to be insignificant.

5.9.2 Government and Public Concerns

Presenters told the Panel that if an incinerator experienced upset conditions toxic gases would be released into the air without having been treated by pollution control equipment. As one intervener explained, the problem with bypasses is that:

- There are no pollution control systems on them;

- There are no monitoring devices on them; and
- There are no regulatory limits on the length, frequency, and volume of bypasses.

The early schematic diagram of the proposed incinerator and description of its operation did not include a thermal relief valve. Presenters questioned whether the vent stack would be located before or after the secondary combustion chamber and whether it was possible to mitigate the effect of releasing gas via the thermal relief valve.

Some presenters told the Panel that assumptions about the number and duration of upset conditions used by the health risk assessment were too low.

STPA explained that they had been advised by operators of other incinerators that upsets only occurred once or twice a year and only for a minute or two. The Panel was presented with other information relating to US hazardous waste incinerator performance in the 1990s that far exceeded this estimate, but STPA also pointed out that the HHRA had over estimated the time of operation by assessing five years of operation instead of three, and once release per month for 30 minutes rather than 1 minute. The volume of emissions during upsets was assumed to be ten times greater than normal.

STPA explained the frequency of upset conditions can be minimized through much control of feedstock consistency, as well as the experience of the operator and effective monitoring of performance parameters. STPA pointed out that the relief valve is usually located after the secondary combustion chamber. Because the temperature in the secondary chamber is kept at 1200°C, any trace organic contaminants would have been almost completely destroyed and the gas as it exits the

stack would be virtually free of PAHs, PCBs, dioxins and furans. STPA further noted that the bypass stack is not the first step in handling any upset condition in the incinerator.

STPA stressed that in the event of a feedstock problem, the primary combustion chamber would shut down but the secondary chamber would operate and destroying organic contaminants. Under controlled shutdown conditions, the feed system would stop immediately and the air pollution control system would continue to operate. There would be no release of gases via the thermal relief valve.

The Panel was advised that an incinerator at St. Amboise, Quebec had experienced no thermal relief valve releases in 2005, and only between 4 and 7 incidents a year between 2002 and 2004, totalling between 39 and 59 minutes per year.

One presenter acknowledged the difficulties involved in trying to measure thermal relief valve emissions because ordinary stack testing equipment is not designed to handle the higher volume.

The Panel was advised of a number of incidents in the United States in the 1990s when there were serious physical breakdowns, including explosions, in hazardous waste incinerators. The Panel was also told about events in Canada involving a permanent hazardous waste facility at Swan Hills, Alberta, and a mobile incinerator at Goose Bay, Labrador which operated January–August, 1990. During this time the Goose Bay incinerator had two serious incidents. The first one involved an unexpected power failure leading to the faulty operation of a draft control mechanism. However, emissions were contained because the incinerator had been enclosed, for purposes of weather protection, in a large plastic dome. The facility was shut down for a month of inquiry and retesting. In the second incident,

the water cooling circuit failed to operate properly in spite of backup systems and as a result a section of the scrubber melted, resulting in an uncontrolled release of emissions.

In spite of these two incidents, Environment Canada considered the operation at Goose Bay to be successful because 3,500 tonnes of solids and liquids were destroyed and the incinerator otherwise operated in compliance with its permit.

The incident at the Swan Hills facility in 1996 involved contaminants accidentally vented to the atmosphere over an 8-hour period. The Panel was advised that the release was related to the malfunction of a transformer furnace. Subsequent to the release elevated levels of PCBs and dioxins and furans were found in deer, moose and fish from the area immediately surrounding the facility and wild game and fish consumption advisories were issued. The levels of contaminants have since declined but the advisories remain in-place.

As a result of such incidents some presenters questioned whether incineration could be considered a proven technology.

STPA responded by maintaining that there is a big difference in the operating history of the incinerators of the 1990s and those functioning today. Since coming under new management in 2001, the Swan Hills facility has experienced no bypass events, major or minor.

Some representatives of Sydney's medical community told the Panel that the spectre of a major catastrophic event had influenced their opinion that incineration was not an appropriate remediation approach. The representative of the Medical Officer of Health office expressed the view that any unplanned major incident could derail the whole remediation program.

CBRM expressed concern about the potentially catastrophic consequence for Sydney residents should an incident similar in nature to that of Swan Hills occur at the VJ site.

5.9.3 Panel Conclusions and Recommendations

STPA had consulted with other incinerator operators as to the frequency of bypass events and concluded that the majority of them would be a minute or less. The Panel is concerned that this might be an overly optimistic assessment, but recognizes that the HHRA otherwise employed very conservative assumptions.

The Panel recognizes the difficulty of monitoring thermal relief valve emissions. The Panel believes every effort should be made to document and monitor bypass events.

The Panel has noted the history of major incidents involving incinerators both in Canada and in the United States, and recognizes the impact such events can have on a local community concerned about its health and safety. However, the Panel also noted the absence of any human health effect studies documenting the results of such major events. The Panel was told about both major break downs and minor upsets involving hazardous waste incinerators in the United States. The Panel notes that the performance of incinerators operating 10 or 15 years ago would not necessarily be the same as more modern units. However the Panel is concerned that Canadian experience with mobile incinerators is very limited, with only one having been permitted by Environment Canada. In response to a request from the Panel on additional information on mobile PCB incineration in Canada, Environment Canada referred the Panel to a 1996 Commission for Environmental Cooperation report. It states:

What options exist for disposal? Until recently, there have been very limited readily accessible PCB destruction options available in Canada. Several attempts at siting PCB incineration facilities have failed as a result of strong public opposition. Two mobile incineration projects have been completed. A third project, scheduled for three sites in Quebec, is soon to be implemented.

While Environment Canada considered the Goose Bay experience a success, the Panel views two major incidents in the course of a few months as disquieting. The Panel is therefore left with an insufficient comfort zone with respect to the operating efficiency and safety of mobile incinerators.

The Panel concludes that, based on the information presented, hazardous waste incineration in North America has had a patchy track record, with a history of malfunctions, accidents and compliance issues. Similarly, the earlier Tar Ponds incineration project and the more recent Sydney municipal waste incinerator encountered serious technical problems. The Panel recognizes that both operators and regulators may have gained valuable experience over the years, that incineration and monitoring technologies have advanced, and that regulatory requirements have become more stringent. The Panel acknowledges that both levels of government endorse the use of hazardous waste incineration in principle, and that permanent incinerators are apparently operating successfully in Canada, although not without their critics. Nonetheless, the Panel has a number of concerns:

- The operator of a mobile or temporary incinerator will be gone from the community in less than five years and therefore does not have the same stake in maintaining relationships and reputation that the operator of permanent facilities might have;

- Any incineration facility is only as good as its operator; therefore it will be as important to evaluate the credentials and record of potential operators as it is to evaluate technologies;
- STPA did not provide a lengthy list of successful mobile / temporary incinerator projects. There have been just three Canadian precedents. The Panel was not reassured by the information provide on the Goose Bay incinerator. The facility experienced two major incidents in the space of a few months, causing it to be shut down for a considerable period of time but was still labelled “successful” by the federal regulator;
- The incinerator component of the Project is large when compared to other Canadian and US remediation projects and Tar Ponds material is heterogeneous. The Panel is concerned that the characterization of the sediment to be incinerated remains incomplete;
- It seems probable to the Panel that if there are to be difficulties fine-tuning incineration operations, especially with respect to conditioning the Tar Ponds materials and the other feedstock appropriately, these will occur at the beginning of operations. The proposed incinerator will only operate for three years. If start-up difficulties occur and are prolonged for any reason, they could, if nothing else, dent public confidence (which is evidently shaky at best);
- The regulators in this region have acknowledged that they do not have extensive experience with hazardous waste incineration projects; and
- There will likely be huge financial pressures on the incinerator operator to complete the job on schedule. The Panel anticipates that this could result in an incentive to cut corners if there were any

equipment or feedstock problems that threatened to cause significant delays.

The Panel does not believe that these concerns are sufficient to reject the use of incineration if the assessment of risks and benefits required by the *Toxics Substances Management Policy* determines that destruction of the higher concentrations of PCBs is the preferred approach (see Recommendation 3). The Panel does believe that (a) the tendering process should ensure scrutiny of the credentials and record of potential operators, (b) the equipment should employ the same or comparable technology and mitigation that would be required if a permanent facility were being permitted, (c) financial safeguards should be in-place to address any risk of non-performance, (d) regulators must fill any gaps in their knowledge or experience to ensure that they apply and enforce adequate regulatory safeguards, (e) STPA should engage with the local community surrounding the incinerator site to provide information and address concerns, and (f) there should be independent monitoring oversight of the incinerator's operations with timely reporting to the public.

Recommendation #26

Incinerator Bidders' Track Record

The Panel recommends that, when requesting proposals for incineration services, STPA require bidders to provide full disclosure of their track record in constructing and operating comparable facilities including their record of regulatory compliance, and this information be (a) placed on the public record, and (b) be given significant weighting in the bidder evaluation process.

Recommendation #27

Bond Requirements

The Panel recommends that STPA require the successful incineration bidder to post a bond sufficient to cover the costs of completing the safe destruction, disposal or management of the contaminated materials intended for incineration, in the event that, for reasons of equipment malfunction, accidents, or failure to comply with regulatory requirements, the bidder is unable to deliver the contracted services in a safe and timely manner.

Recommendation #28

Increasing Regulatory Capacity

The Panel recommends that NSEL review existing staff capacity in relation to the skill set and experience required to oversee an effective permitting and enforcement program for hazardous waste incineration, identify gaps and fill those gaps through appropriate training or staff acquisition.

Recommendation # 29

Thermal Relief Valve

The Panel recommends that STPA be required by NSEL and PWGSC to install appropriate pollution control mechanisms on the thermal relief valve if it is technically possible to do so, and to investigate and incorporate ways to monitor emissions from the valve. STPA should also be required to develop appropriate protocols to deal with malfunctions.

Recommendation # 30***Monitoring Upset Conditions***

The Panel recommends that STPA be required by NSEL and PWGSC to monitor upset conditions at the incinerator and report them immediately to regulatory authorities, including the Medical Officer of Health. An appropriate response plan should also be put in place.

5.10 MONITORING AND COMMUNITY INVOLVEMENT

Although public concerns for health and safety remain despite the predictions of the air dispersion modeling and health risk assessment studies, both federal and provincial government departments agreed with the conclusions of STPA that no significant adverse health effects would occur as a result of the incinerator operation. However, the Panel heard from individual medical professionals who opposed incineration. Some opposition was based on the possibility that a major accident might occur while others emphasized the effect incineration would have on the community's emotional health in the form of stress and anxiety. The Panel also noted that CBRM council passed a motion prior to the hearing opposing incineration. The Panel was also informed that while the community may at one time have favoured excavation and destruction of PCBs, at least some people would have changed their minds when it became apparent that this would involve siting an incinerator in CBRM.

STPA stated that the predicted effect of the incinerator upon the VECs would be of minor significance. The Panel agrees in general but has some concerns with the effects of the incinerator operation on surface water and on water usage. These effects can be managed but will require close monitoring. The Panel is also concerned with the limited amount of

biophysical data presented in relation to the Phalen site and, as a result, recommends consultation with the area community before construction of the incinerator is begun.

The Panel concludes that, with the best possible pollution control equipment in-place, supported by extensive monitoring and operated by experienced and adequately trained personnel, it is probably technical feasible to operate a mobile incinerator without causing significant health or safety problems.

There are, however, some offsetting factors to be considered by decision makers. Incineration would destroy only a portion of the PCBs and PAHs in the Tar Ponds although the contaminated sediments the Tar Cell and in Coke Ovens Brook would also be destroyed. CBRM has taken a formal position against incineration, and local health professionals believe that public anxiety and fear related to incineration is a real factor that should be considered seriously. Any decision to proceed with incineration as part of the remediation package is bound to be met with vigorous opposition by some members of the public. These factors could provide a sound basis for a decision not to go forward with incineration in spite of the fact that it might be technically and economically feasible to do so.

If the decision is made to proceed with incineration as part of the Project, subject to the risk benefit assessment recommended in Chapter 2, it will be essential that STPA carry out effective monitoring and involve the community fully.

The Panel has recommended that STPA carry out various monitoring related activities in connection with the incinerator component of the Project. These include:

- Using best available technologies and practices to monitor air emissions

including dioxins and furans (Recommendation #21);

- Monitoring air emissions (Recommendation #6), the effects of water usage at the incinerator site on groundwater resources (recommendation #23), the effects of incinerator operations on surface water bodies (Recommendation #24); and
- Investigating the potential to monitor intermittent emissions from the thermal relief valve (Recommendation #29).

The Panel also heard from Environment Canada, Health Canada and NSDNR that it would be important to monitor the environmental effects of incineration on certain key receptors.

Recommendation #31

Monitoring Environmental Effects of Incineration

To validate the conclusions of the modeling and risk assessments the Panel recommends that NSEL and PWGSC require STPA to include the following in its monitoring and follow-up program:

- **Establishing baseline conditions;**
- **Monitor contaminant levels in country foods such as fish and berries, and in garden produce; and**
- **Monitor effects of air emissions on sensitive lichen species.**

The Panel understands that, currently, the CLC does not include any representation from the Grand Lake Road or New Waterford areas. The Panel also notes that there were no presenters at the hearings from the New Waterford area to talk about any issues with respect to the Phalen Mine site alternative. The Panel presumes that this was because New Waterford residents assumed that the Phalen

Mine site was no longer in active consideration, rather than because there are no local concerns about incineration. Therefore, were STPA to consider relocating the incinerator to the Phalen Mine site, the Panel advises that they should inform and consult at the earliest opportunity with New Waterford stakeholders.

Recommendation #32

Community Involvement

The Panel recommends that STPA, in collaboration with the Community Liaison Committee (see Recommendation 55) be required by NSEL and PWGSC to develop a community consultation program to engage with residents in the vicinity of the incinerator site to provide information, identify and address concerns, and establish an ongoing reporting protocol.

In Chapter 8, the Panel has recommended the creation of an independent Monitoring Oversight Board with a mandate to meet as often as necessary to review compliance and effects monitoring programs and results, and to report to the regulators, the Community Liaison Committee and to the general public. The Panel anticipates that this Board would play an active role throughout the life of the incinerator.

6 SOCIO-ECONOMIC CONSIDERATIONS

One of STPA's primary Project objectives is to "to enhance the development potential and investment climate in CBRM and to provide social benefits for CBRM as a whole." This objective is based on the premise that the Tar Ponds and Coke Ovens sites are an impediment to investment and economic growth in Sydney. STPA stated that the remediation Project is intended to result in tangible economic benefits, which include the transformation of unused and inaccessible lands "to an area suitable for passive and active recreation, commercial development, or light industrial land uses." The remediation is also expected to enhance aesthetics in the area.

6.1 EMPLOYMENT AND ECONOMY

6.1.1 STPA Assessment

The majority of Project expenditures and associated benefits are related to the eight-year construction phase for the Tar Ponds and Coke Ovens sites and for construction, operation and decommissioning of the incinerator. These activities are expected to create direct, indirect and induced employment and income for the CBRM, Cape Breton, and the Province. STPA also anticipates that the additional employment and income may reduce out-migration by younger adults. STPA estimates that direct labour for the Project would create between 380 and 435 years of full-time employment, including both technical and trade related positions, over the eight-year construction period. STPA intends to source labour locally first when qualified individuals are available, and has suggested that "special measures" (which were not specified) may need to be considered to ensure employment equity.

STPA has developed a Statement of Intention Regarding Local Economic Benefits, which it has made public on its website. The

document outlines STPA commitment to implement the Project in a manner that provides maximum possible benefits to the local economy. The Statement of Intention identifies specific objectives relating to employment opportunities for Cape Breton residents, contract opportunities for Cape Breton companies, and research and training related opportunities for local educational institutions.

The operation phase at the Tar Ponds and Coke Ovens Sites would have limited labour and equipment requirements – a total of five years of full-time employment. It is of note that STPA has not mentioned what happens when all of the construction jobs end.

STPA indicated that there is potential for adverse effects on local labour supply if high demand by the Project causes local labour shortages and affects the operation of other businesses or projects. However, STPA also considers that not using local labour could result in an adverse effect. Labour effects are predicted to occur during the construction phase and incinerator operation stage between 2006 and 2013.

Noise emissions and traffic may cause adverse effects on local businesses during all construction phases and during the operation of the incinerator. However, STPA has committed to procure supplies and services locally, which should result in positive effects. STPA also anticipates longer-term positive effects on business because site remediation would stimulate further investment and economic growth.

STPA proposes to source between 65% and 75% of labour and supplies locally in Nova Scotia. Local post-secondary institutions have produced technologists, engineers and other specialists that have remained in the region, and

STPA indicated that local institutions such as Cape Breton University and Nova Scotia Community College can accommodate increased enrolment as well as industry demands to develop specific training to meet needs within a short time span.

STPA has established a relationship with Cape Breton University by collaborating on research, including projects on fish and capping materials. STPA has also committed funding in support of the University's application to establish a major research centre.

STPA did not provide projected employment and local procurement information for the full-containment no-incineration alternative.

6.1.2 Government and Public Concerns

Nova Scotia Transportation and Public Works informed the Panel that the Tar Ponds and Coke Ovens remediation should be the engine for CBRM's economic renewal. This opinion was shared at the hearings, not only by business organizations, but also by health care sector representatives. These representatives pointed out that income is a major determinant of health outcomes and that long term socio-economic benefits would be an important contributor to community well-being.

The Province has asked STPA to develop a comprehensive economic benefits strategy similar to those required of offshore oil and gas development Projects. The Province's first set-aside project (the remediation of the cooling pond) for First Nations has been negotiated with Membertou First Nation. Junior Chamber International has recommended that STPA create a Legacy Fund equal to 5% to 10% of the total Project budget to be used to lever new investment in local industry, research, and arts and culture associated with future land uses on the sites.

The Panel was told that the business sector in CBRM has been very active in promoting the importance of ensuring maximum local content in the remediation work in order to retain and build on economic benefits. The Cape Breton Partnership, a consortium of business and other community organizations formed in 2005 to promote a unified regional approach to economic development, has created an Economic Benefits Action Team (EBAT) specifically to address the Tar Ponds and Coke Ovens Project.

EBAT's mandate is to improve the business climate and attract investment, increase local employment opportunities, and promote sustainable new business and wealth generation. Therefore the Cape Breton Partnership wants STPA to use Cape Breton labour, products and services, as well as engage local businesses, transfer skills and capacity, stipulate Cape Breton content for off-Island firms, and create a sustainable business legacy. EBAT wishes to be involved in developing local capacity-building workshops and assisting local companies to create partnerships and alliances to bid for cleanup work. EBAT has submitted a proposal to STPA on these issues. EBAT also wants to establish a think tank to engage in strategic planning with respect to the Project and to be involved in the monitoring of economic benefits.

Presenters recommended that STPA design bid criteria so that local companies have opportunities to compete, either alone, in local consortiums, or in partnership with outside firms. They also want to see targets for Cape Breton participation with weighting schemes to evaluate bids, together with monitoring to track and measure local benefits.

STPA indicated during the hearings that they have recently commissioned a study to identify local labour and business capacities and have set up a local business directory to assist

connections between local and off-island firms. In addition, proposal bids have included some local benefits criteria.

In order to maximize the employment of Cape Breton residents, the Panel was told that there needs to be a match between local skills and Project requirements. ECO-Canada (Environmental Careers Organization of Canada – a member of the Human Resources Sector Council) informed the Panel that there is significant unmet demand for environmental remediation specialists across Canada. STPA's labour capacity study would be crucial in determining the gap between demand and supply. There are various training institutions ready to provide specialized training if necessary, and after the remediation is complete, businesses and experienced remediation specialists should find ample opportunities elsewhere. Others also emphasized the importance of providing training to ensure that local residents are employed on the Project.

Equity of access to employment was discussed. ECO-Canada has a Project which focuses on people over the age of 30 and promotes the participation of Aboriginal people in environmental careers. The Cape Breton Black Employment Partnership Committee told the Panel that many African Nova Scotians living in CBRM, some directly adjacent to the Tar Ponds and Coke Ovens sites were skilled or general labourers but very few had been employed in the earlier stages of the remediation. The Committee was of the opinion that Project employment could build trust and confidence with residents who had been adversely affected by the contaminated sites, and that STPA needed to institute equity policies and appropriate monitoring.

In response to a question from the Panel, local business organizations indicated a willingness to promote more training for women in non-traditional trades and technology, and

STPA indicated their support for equitable access to employment for women and for minority groups.

The Panel did not hear concerns expressed about potential disruption to local businesses caused by remediation activities, or about fears of competition for skilled workers.

6.1.3 Panel Conclusions and Recommendations

The Panel understands that maximizing local economic benefits is seen as an important component of the Project, especially given the amount of spending that would occur and the length of time that the Project would take. The Panel observes that CBRM has significant organizational capacity to work with STPA to promote local economic participation in the Project, including an economic development manager on staff with the regional municipality and a number of experienced, active business organizations including the newly-formed Cape Breton Partnership. Furthermore, the Panel observes that STPA is already collaborating with the business sector to enhance opportunities for local participation.

Some important aspects of ensuring local economic benefits relate to securing future uses on the remediated sites; these are covered separately in section 7.2.

The Panel endorses the Province's request that STPA prepare a comprehensive economic benefits plan, similar to those prepared in the offshore oil and gas sector. The Panel notes that the Project is essentially a construction Project, and that Cape Breton has, in the past, had experience with the boom and bust effects of large construction Projects. Therefore the Panel believes that all parties involved in economic development issues in CBRM should focus on identifying

opportunities to create lasting business and employment benefits.

Recommendation # 33

Economic Benefits Strategy

The Panel recommends that STPA be required by NSEL and PWGSC to develop a comprehensive economic benefits strategy to ensure that economic benefits and employment accrue locally to the greatest extent possible. The strategy should include a monitoring and reporting program to track local business and labour participation in the Project. The strategy should also address ways in which the Project can help to develop local business capacity and labour market skills in order to have lasting effects after completion of the remediation.

The Panel observes that local access to employment on the Project would be an important means of generating socio-economic benefits.

The Panel anticipates that fewer women than men in Cape Breton are currently qualified in the trades and technologies required by the Project and therefore may not be able to access many of the employment opportunities. The Panel appreciates that women are entering non-traditional occupations in greater numbers but concludes that STPA, in collaboration with local partners, still needs to develop a proactive approach to ensure that Project employment benefits are available to both men and women.

Recommendation # 34

Women's Employment Strategy

The Panel recommends that STPA carry out a gender analysis as part of their forthcoming labour capacity study, and work with local women's organizations, business

organizations and education and training institutions to develop a women's employment strategy to promote and facilitate the participation of women in the non-traditional trades and technologies required by the Project. STPA should also monitor the participation of women throughout the life of the Project. This strategy and associated monitoring program should be integrated into the overall Economic Benefits Strategy and its reporting requirements.

The Panel recognizes the presence of African Nova Scotian residents particularly in the community of Whitney Pier and the role that members of this community played in the steelmaking industry. The Panel recognizes that African Nova Scotians often face additional challenges in obtaining training and employment, and agrees that policies that facilitate their participation in the Project would help to build community trust and spread Project benefits more equitably.

Recommendation # 35

African Nova Scotian Employment Strategy

The Panel recommends that STPA, in consultation with the Cape Breton Black Employment Partnership Committee, develop equity policies and training and outreach programs to promote and facilitate the training and employment of African Nova Scotians on the remediation Project, and should monitor the results throughout the life of the Project. This strategy and associated monitoring program should be integrated into the overall Economic Benefits Strategy and its reporting requirements.

6.2 INFRASTRUCTURE AND SERVICES

6.2.1 STPA Assessment

STPA indicated that many advance Projects have been completed recently in preparation for the Project, which would in part alleviate some impacts on local infrastructure. This includes the relocation of the Victoria Road water main, construction of the Battery Point sewage treatment plant, and realignment of Wash Brook to allow installation of a sewage receptor.

STPA acknowledges that construction and operation of the Project may increase pressure on existing municipal and regional infrastructure including water supply, sewage treatment, waste management and electricity.

Demand for municipal water supply is limited to onsite showers, washrooms, and truck washing and is anticipated to have minimal impact on the municipal supply at the Coke Ovens and Tar Ponds sites. At the incinerator site there would be demand for significant volumes of process water as well as water reserved for fire protection. STPA indicated that this water would be provided by groundwater.

STPA anticipates large quantities of waste water from sediment dewatering, debris washing, contaminated surface drainage, and contaminated groundwater pumping. While surface water and groundwater controls would be used to minimize overall water treatment requirements, large volumes of water would still require treatment. STPA has not clearly indicated how much of this water is likely to be directed to the municipal sewage system as opposed to directly discharged following on-site treatment.

STPA indicates that demands on electrical infrastructure would be minimal at the Tar Ponds and Coke Ovens sites. The

incinerator requires a continuous power supply to be backed up by a diesel generator. STPA identified no impacts to electrical infrastructure.

STPA indicated that waste generation and offsite disposal of waste material would be minimized where feasible. Anticipated waste streams that would leave the site include existing scrap materials (metals), domestic wastes, and some contaminated combustibles. Contaminated non-combustibles (bricks, concrete etc) would be buried on site, while maintenance wastes (oils and filters) would be destroyed at the incinerator. STPA predicted no adverse effects on existing waste management infrastructure.

6.3 TRANSPORTATION

STPA indicated that the primary impact associated with transportation is increased traffic volumes from trucks and passenger vehicles on existing roads, which could cause both nuisance effects and increased potential for vehicle collisions. These effects are expected to occur between 2006 and 2013. Post 2013, when the Project goes into operation mode and incineration is complete, STPA considers that transportation effects would be minimal.

6.3.1 Trucking

STPA indicated that for the purposes of capping the two sites, 150 daily truck trips (75 loaded and 75 empty) would occur with a peak of 15 trucks per hour during the construction phase. These trucks would include tandem, tri-axle, and tractor-trailers. An additional 10 concrete trucks per day are also anticipated. The movement of these trucks and other construction related vehicles during peak traffic flow periods is, according to STPA, the most important determining factor with respect to adverse effects on transportation infrastructure. While STPA indicated that these vehicles would likely use the SPAR for accessing the Project site, they

have not determined the source of either the capping materials or the cement required for solidification activities, thus making an assessment of impacts on other roads difficult. STPA expects little requirement for trucking following the construction phase at the Tar Ponds and Coke Ovens sites.

STPA's assessment of transportation impacts did not specifically discuss the number of trucks that would be used regularly at the incinerator site during construction. The EIS indicated that the incinerator would be transported to the site in components by either tractor-trailer or train.

Trucking during operations is expected to be limited to approximately one truckload of fly ash per day from the incinerator to be returned to the Tar Ponds or to be disposed of in a licensed hazardous waste disposal site. STPA considers any truck traffic related to the incinerator sites to be minimal and not expected to have a significant effect on traffic infrastructure. That having been said, STPA has indicated that the Grand Lake Road / VJ Access Road intersection should be further investigated for traffic light requirements.

6.3.2 Rail

STPA intends to transport contaminated materials to the incinerator site using rail. It is expected that incinerator bottom ash, to be used as fill at the remediation sites, would also be transported back to the site by rail. The rail transport route would begin at a loading facility along the existing SYSCO rail spur, and then carried through Sydney Junction along the Sydney Coal Railway to the VJ site or further to the Phalen Mine site. STPA notes that the use of the Phalen Mine site would result in additional train movements (twice per day) over nine rail crossings in New Waterford.

Based on the anticipated volume of material to be excavated for incineration, STPA estimates that one train load of material per day would run between the rail loading facility and the incinerator site. The EIS indicated that the train would deliver approximately 28 to 30 rail cars with three enclosed containers per car. However, during the hearings the Panel heard that STPA would more likely use traditional covered, watertight rail cars, which would be directly loaded (without containers). The direct loading approach, according to STPA, would likely reduce the total number of cars required. Material would be unloaded under a covered facility at the incinerator site.

During the hearings, STPA indicated that rail shipment of contaminated material to the incinerator would occur primarily during the warmer months (5 to 6 months / year) to avoid freezing materials and complicating the offloading process.

6.3.3 Passenger Vehicles

Based on the projected employment of 100 daytime workers and 25 night time workers, STPA anticipates approximately 180 site worker vehicle trips per day at the Tar Ponds and Coke Ovens Sites (90 in each direction). The maximum passenger vehicle traffic anticipated in relation to the incinerator sites is 18 trips per day during operations. STPA does not predict that these passenger vehicle trips would have any significant effect on existing traffic. STPA indicated that the potential effects on transportation could be kept to non-significant levels through traffic management; however such a plan has not yet been developed.

6.3.4 Permits and Authorizations

Streets and roads to be used in relation to the Project are either under the authority of Nova Scotia Department of Transportation and Public Works (NSTPW) or CBRM. Truck

weights and dimensions permitted on streets and roads are regulated by *Weights and Dimensions of Vehicle Regulations* under the *Motor Vehicle Act*.

STPA has indicated that further investigations would be undertaken with respect to traffic light requirements at the intersection of Grand Lake Road and the VJ Site. The decision to implement this measure would need to be made in consultation with the responsible traffic authority.

Rail lines proposed for moving materials to the incinerator are owned and operated by the Sydney Coal Railway Inc. NSTPW is responsible for safety regulation of railways that operate solely in the Province. Under the *Transportation of Dangerous Goods Act* the federal government is responsible for regulating the transportation of dangerous goods by rail.

STPA would be required to comply with provincial and federal legislation for the transportation of dangerous goods. Transportation by road would fall under provincial authority, while transportation by rail is under federal authority.

6.3.5 Government and Public Concerns

While traffic was discussed during the hearing process, the Panel did not hear a great deal from stakeholders with respect to concerns of impacts on transportation infrastructure. Grand Lake Road residents did tell the Panel that past problems had occurred with the movement of coal trucks to and from the former VJ Wash Plant. STPA proposes to move material to and from the proposed VJ incinerator site primarily by rail in enclosed cars which would reduce impacts on Grand Lake Road. However, local residents also complained that CBDC had made promises with respect to management of traffic impacts, which had subsequently been ignored by the trucking

contractors. The issue of ensuring that contractors abide by policies and management plans is relevant to the Project under assessment.

Questions were also raised about rail safety and the capacity of the existing private rail infrastructure to transport contaminated materials to the VJ site. Residents told the Panel that the rails and rail bed were not in good condition and that they were concerned that an accident could occur, possibly resulting in the contamination of Grand Lake.

NSTPW was questioned about potential impacts on transportation infrastructure and departmental resources. The department told the Panel that the construction of the SPAR was intended in part to alleviate the impacts of truck traffic related to the Project on local roads. The SPAR is linked to Highway 125, and NSTPW feels that this would ensure most truck traffic is limited to the provincially maintained highways. NSTPW also indicated that they would want to be involved in ensuring that transportation impacts are managed. The Department said it would work with STPA and CBRM to address transportation impacts.

The Panel also heard from NSTPW about investigations being conducted on a clay deposit in the River Denys area. If sufficient quantities exist, this material would be accessible by rail which could presumably decrease the volume of trucks hauling capping materials by road.

6.3.6 Panel Conclusions and Recommendations

The Panel recognizes that the construction of the SPAR road and the proposed use of rail to transport materials to and from the incinerator site would help to reduce transportation related impacts. However, the Panel concludes that the increased number of

trucks going to and from a very large construction site in the middle of Sydney for several years could potentially cause both nuisance (noise, dust, delays) and safety impacts. While the Panel did not hear very much from local residents on this issue, the Panel believes that this does not indicate that there would not be significant levels of local concern from both residents and businesses once the Project begins.

The Panel believes that minimizing transportation impacts would require:

- A comprehensive transportation management strategy, updated frequently;
- A tracking system to monitor truck movements and timing;
- A compliance system to ensure that all contractors are aware of Project policies and requirements and comply with them;
- A commitment to share relevant and timely information about Project activities and transportation requirements with affected stakeholders; and
- Willingness to work with stakeholders to adapt Project activities where possible to mitigate impacts.

Recommendation # 36

Transportation Management Plan

The Panel recommends that STPA be required by NSEL and PWGSC to develop a Transportation Management Plan before Project construction begins. STPA should consult with NSTPW and CBRM in preparing the Plan, which should address infrastructure impacts, transportation routes, timing, dust management, safety issues, contractor compliance, communications, monitoring and reporting. The Plan should include an easily accessible

complaints mechanism and proposed mitigation alternatives. STPA should review the Plan with the Community Liaison Committee on a regular basis (no less than once a year).

Recommendation # 37

Ensuring Rail Safety

The Panel recommends that STPA be required by NSEL and PWGSC to file a Rail Safety report with NSTPW before Project approval is given. The report should document:

- **The current capacity of the rail infrastructure between the Tar Ponds and incinerator sites to safely transport materials;**
- **Any improvements required; and**
- **A spill contingency plan as an integral part of the Project's Environmental Management Plan.**

The Panel observes that since the Project sites are served by rail, STPA should pursue any additional opportunities to reduce impacts on roads, businesses and neighbourhoods by transport capping or solidifying materials by rail.

Recommendation # 38

Use of Rail to Transport Construction Materials

The Panel recommends that wherever possible, STPA identify and employ additional opportunities to transport construction materials by rail to the Project sites to reduce transportation impacts.

6.4 FUTURE USES OF THE TAR PONDS AND COKE OVEN SITES

6.4.1 STPA Assessment

As defined in the Terms of Reference for the Joint Review Process, the Project under assessment does not include final uses of the Tar Ponds and Coke Ovens sites. The original Project Description cited in the Terms of Reference commits STPA to restore and landscape both sites “in a manner compatible with the natural surroundings of the area and future site uses.” The EIS indicated that a final use plan had not yet been developed and that, in the interim, both sites would be covered with a grading layer of native soil to facilitate temporary or permanent vegetation. The EIS also cautioned that future uses must take into account the ongoing presence of contaminants under the capped surfaces and the need to accommodate long-term environmental management and monitoring.

However, the capacity of the sites to support future development is pertinent to the assessment of the Project because STPA sees the transformation of the two sites into an area suitable for “passive and active recreation, commercial development or light industrial uses” as a key component in delivering socio-economic benefits, one of the Project’s main objectives.

STPA indicated that capacity to sustain future use was not a primary concern in evaluating alternative remedial options. During the RAER evaluation process, alternatives were measured against both performance and community evaluation criteria. One of the latter criteria was to “maximize long term benefits.” Options that removed and destroyed contaminants were ranked higher than containment options. However, in the discussion of options contained in the EIS, future use was not mentioned.

During the public consultation process carried out by JAG in 2002, community participants expressed a preference for “public parkland with a mixture of uses including waterway, recreational areas with green space, playgrounds, family areas, and boardwalk.” In the video prepared by STPA in 2005 for wide public distribution entitled *Sydney Tar Ponds & Coke Ovens Cleanup: A Virtual Tour* this theme was continued with artist impressions of a future park, golf course, and walking trails. Similar concepts are shown on STPA’s website with the addition of potential light industrial development on the Coke Ovens site. STPA showed additional land use concepts during the hearings, and also provided some examples of the redevelopment of brown field sites in other cities. STPA noted that where downtown land is particularly valuable, for example in the centre of Melbourne, Australia, extensive redevelopment is possible.

STPA does not contemplate any residential development occurring on the sites. STPA indicated during the hearings that they understood that CBRM had ruled out residential land use earlier during the JAG process.

STPA indicated that one of the primary reasons for carrying out solidification and stabilization of the Tar Ponds is to improve the geotechnical properties of the site in order to initially enable the use of heavy equipment for the purposes of the remediation, and then ultimately to support future land uses. The target bearing capacity is currently 17 psi, which STPA indicates would support recreational and park uses, as well as the construction of one-storey buildings, while at the same time being sufficiently friable (equivalent to a clay soil) that if necessary, and with all due environmental safeguards, excavation would be relatively easy. STPA also indicated that adaptations to the design of the solidification, stabilization and capping may be possible to accommodate

specific future use requirements, such as the construction of a road or a larger building.

Bearing capacity on the Coke Ovens site would need to be assessed for each given area and the location of buried infrastructure might be an issue. Only approximately 40% of the Coke Ovens site would be capped. Most of the remaining area is owned and was remediated by the Cape Breton Development Corporation. A portion would likely be used to landfill non-hazardous waste debris. For the remainder, commonly known as Mullins Bank, STPA did not indicate that there would be any significant constraints to development.

On the capped portions of both sites, STPA indicated that only shallow-rooted vegetation would be allowed, but that areas could be made available for trees by creating berms or adding extra thickness of soil. STPA originally suggested that the cost of these measures would be the responsibility of future developers but at the hearings agreed that they could possibly be built into the design of the Project. STPA also told the Panel that grading on the Tar Ponds site required to create the necessary slope towards the channel for surface water drainage could result in considerable thicknesses of cover material along the SYSCO side of the site, permitting tree growth in selected areas.

In response to an information request before the hearings, STPA stated that future development on either site would need to maintain the integrity of the site caps and allow ongoing operation and maintenance of surface water drainage and collection systems and groundwater management systems. This would be accomplished in two ways:

- Through site planning, STPA envisages a system of public open spaces containing the key above and below ground features of the remediation

infrastructure. Between these open spaces, other land uses would be possible; and

- Through institutional controls (deed restrictions, municipal planning bylaws or development agreements), the type and manner of development would be controlled with respect to issues such as excavation depth, type of structure, installation of below grade services, setbacks from environmental management facilities, and landscaping.

How long these restrictions on development might apply appears uncertain. STPA originally indicated in the hearings that the sites might be in what was referred to as a “walk away” condition (no further monitoring or maintenance required) in or around 25 years from the completion of the Project. In the case of the Coke Ovens site this would be because the remaining contaminants had decayed sufficiently that they no longer represented a risk to human or ecological receptors. In the case of the Tar Ponds site this would be because there was no longer any concern about contaminants leaching from the solidified sediments.

If there were to be a hiatus between the completion of the remediation and the establishment of a permanent, managed land use on either site, STPA indicated that public access to the sites might have to be controlled if unmanaged activities threatened the integrity of the encapsulation systems.

6.4.2 Government and Public Concerns

The Panel heard criticisms of the lack of information on achieving sustainable future uses in the EIS, which was seen as mainly focusing on the details of how the Project would meet its first objective – reducing ecological and human health risk. It was pointed out that during the JAG process, the community put strong

emphasis on the importance of maximizing long-term benefits, but the technology selection process did not examine how different levels of remediation could contribute to reaching this goal. Remediation plans are generally guided by land use plans or future use objectives; some people felt that this step had been omitted to the detriment of the Project.

A number of submissions related to the need to rectify this concern by developing and committing to a future use plan as soon as possible. This is seen as being vital in terms of both persuading CBRM residents to understand and accept the inevitable disruptions and inconveniences associated with the remediation, and of beginning the process of building confidence in a new, post-Tar Ponds Sydney. It was also suggested that the community might see the promise of viable future uses as compensation for accepting the continuing presence of contaminants, albeit safely contained – “turning a negative into a positive.”

Some participants believed that the proposed encapsulation of contaminants at both sites seriously compromises future uses even with the removal and destruction of PCB sediments over 50 ppm, and the Panel was frequently reminded that a majority of participants in the JAG consultation preferred total removal and destruction.

Representatives of the health community recommended that the redevelopment of the two sites could and should contribute to opportunities for healthy outdoor living for all ages and active transportation, pointing out the prevalence of health issues such as obesity and diabetes in the community. Young people who presented at the hearings, while mainly in favour of harbour-related industrial development, agreed with the need for trails and informal recreation opportunities in the area rather than sports fields. They also reminded all

participants that today’s young people would be the inheritors of the remediation results.

In general, the Panel did not hear much on the subject of future use from residents of neighbouring areas, who mostly addressed concerns about the potential effects of the remediation process itself. At least one presenter expressed the opinion that any future use should respect the fact that the Coke Ovens site is a part of Sydney’s industrial legacy, where several generations of working men and women laboured under very harsh conditions, often with deleterious effects on their health and sometimes loss of life.

The Panel also did not hear comments from residents with respect to the restoration of Muggah Creek as a potential future use for the Tar Ponds site, although this issue was addressed by government presenters from an ecological perspective.

CBRM stated their support for the proposed full containment alternative without incineration and their belief that it is now time to move on with a vision of the future. However, they also indicated their concern that the current Project design has not sufficiently addressed future use capacity. Loss of population is the Region’s overriding problem. The area has been in demographic decline since the 1960’s and the rate appears to be increasing. Projections forecast that the most significant losses would be in the youngest age groups. This affects the regional economy, CBRM’s ability to provide services, and community health and well-being. CBRM is hoping to see the contaminated sites replaced by “a vibrant new land use... a showcase redevelopment” that can attract national attention.

CBRM has primary authority over land use. The provincial government is not bound by municipal planning direction, but the *Municipal Government Act* specifies that they should take

“due regard” of municipal intentions. Part 3 of the Region’s Municipal Planning Strategy (MPS) (completed in 2004 and recently reviewed) is devoted to the corridor between the harbour and Highway 125 that includes the Tar Ponds and Coke Ovens sites. CBRM presented their analysis of land use potential in this area, which has led them to the conclusion that the highest and best use would be light industrial with some recreational uses, particularly an active transportation connection between Whitney Pier and downtown Sydney. Because of the declining population, the region already has sufficient traditional recreational facilities (sports fields and courts, urban parks) and insufficient resources to maintain new facilities of this type. There has been a recent spate of new commercial development in connection with the building of the SPAR link and therefore no need to create a new commercial area, and there is very limited demand for residential land combined with abundant serviced land.

However, CBRM sees great potential for new economic development based on Sydney Harbour, an underutilized asset. The harbour is navigable and sheltered, with plenty of wharf and docking space, extensive lay-down areas, rail access and good connections to the restricted access highway system via SPAR, but, in CBRM’S view, has been restricted by land ownership issues and lack of integrated port planning and management. Together with regional partners including other levels of government and the business and education sectors, CBRM is developing the concept of the Port to Port Corridor, stretching from the Harbour to Sydney Airport. The Corridor concept builds on unused Harbour potential, other transportation assets in this area, and on the need to improve linkages between the major CBRM urban communities. STPA is funding 50% of a forthcoming Corridor study.

The Panel also heard strong support for the Port to Port concept from some of CBRM’s

partners in this initiative, who see the economic potential of the Harbour as being the key to emerging from Cape Breton’s economic doldrums. The Port to Port Corridor Planning Group intends to work closely with STPA in order to provide constructive input into detailed remediation design.

The Panel and others asked questions at the hearings with respect to the availability of harbour-related industrial lands in Sydney and the likelihood that the remediated Tar Ponds and the Coke Ovens sites would be redeveloped, given the constraints posed by the capping systems. CBRM indicated that these sites would not be required for a general cargo terminal. However, CBRM also wishes to develop an ancillary industrial, business and technology park in phases. Again, there is likely sufficient land within the Corridor to accommodate these uses without redeveloping the remediated sites (although this would not meet CBRM’s goal of creating a showcase development on the lands) and CBRM stated that their primary concern would be that whatever happens on the two sites not impede the Port to Port concept by cutting off potential connections or by establishing incompatible land uses. They acknowledged the possibility that the sites might be best suited as a “pleasant buffer” between residential and industrial land uses. The Port to Port Corridor study would presumably address these issues in greater detail.

CBRM informed the Panel that the MPS calls for the use of landscaped buffers in this area – areas of low maintenance, naturalized vegetation along the sides of highways to separate industrial and residential neighbourhoods.

CBRM did express the concern that the current geotechnical parameters and cap design on the Tar Ponds appeared to be focusing mainly on the recreational uses originally envisaged by STPA. One of the business

organizations echoed this concern and asked that STPA consider increasing the bearing capacity of the Tar Ponds site. Failing this, the same organization indicated that they had ideas for a future open space concept involving possible art installations.

CBRM clearly stated that they do not aspire to become the eventual owners of the two remediated sites, because of potential liabilities and because they do not have the technical capabilities to address the specialized requirements of developing contaminated or capped lands. However they believe that ownership and governance of the public lands (approximately 4000 acres) within the Port to Port Corridor would be a critical issue, to be addressed by the forthcoming planning study. Should any part of the remediated sites eventually be transferred into private ownership, STPA has indicated that CBRM would play a role in establishing and enforcing the institutional controls necessary to maintain the integrity of the encapsulation and ground and surface water control systems. CBRM did not discuss this in detail at the hearings but expressed reservations about the effectiveness of deed restrictions.

Finding a viable and sustainable use for the Tar Ponds and Coke Ovens sites in a timely fashion is a critical issue for CBRM. They emphasized that a fenced site would not be compatible with their vision for post-remediation Sydney.

CBRM indicated that the redevelopment envisaged in the Port to Port concept would require further investment of public funds and that they believe that some portion of the \$400 million set aside for the remediation Project should be applied to future uses, especially if – as they recommend – incineration is removed from the Project design. STPA confirmed that this would reduce the total remediation cost by some \$70 million; a saving that CBRM believes

should be invested in establishing a viable future use, even though the terms of the MOA stipulate that unspent funds return to the federal government. Other presenters called for the establishment of a Legacy Fund, possibly 5% to 10% of the total remediation cost, to leverage new investment in industry, research, and arts and culture associated with future land use on the Tar Ponds and Coke Ovens sites.

The Panel asked about the intention to consult the wider public, and specifically residents of the adjacent neighbourhoods, about future uses, noting that the Port to Port Corridor steering committee is mainly oriented to government, business and institutional stakeholders. CBRM indicated that the process is in the very earliest stages and that other opportunities for input would be forthcoming. JCI also told the Panel that they are leading discussions about future use ideas with local organizations and specifically with youth in the area, because they would like the redeveloped sites to act as a magnet for young people, enabling them to stay in or return to the area. They are also intending to engage with local planners and brownfield redevelopment experts to determine best practice ideas.

6.4.3 Panel Conclusions and Recommendations

The Panel believes that finding a viable, sustainable and widely accepted future land use for the Tar Ponds and Coke Ovens sites would be a critical future challenge for the remediation process, for three reasons:

- To deliver the socio-economic benefits through redevelopment of these important downtown lands;
- To successfully redress the stigmatization of the Sydney area; and
- To maintain the integrity of the encapsulation and environmental

management systems through managed land use.

The Panel shares the concern of some presenters that the future uses of the two sites did not appear to be a major consideration in developing the final remediation plan, but recognizes STPA's stated intent to work with the relevant parties to address future use capacity.

The Panel observes the following with respect to the challenges and opportunities relating to future use.

The integrity of the encapsulation system proposed for the Tar Ponds must be maintained for a very long time, perhaps in perpetuity, given that evidence was presented that solidification and stabilization would retard the decay of the contaminants. The length of time that the encapsulation system at the Coke Ovens site must be maintained is less certain. STPA presented evidence that, under circumstances where they are exposed to air and water, PAHs can decay in less than 25 years, but it is not known how the contaminants on the Coke Ovens site would react to in-situ containment.

A portion of the Coke Ovens site (Mullins Bank) may have few or no restrictions for future development. However, the Panel is uncertain of the exact status of this area. STPA did not provide detailed information about the degree of remediation carried out by CBDC. The Panel assumes that the non-hazardous waste debris landfill proposed for this area would restrict development but that growing trees over the landfill would be possible.

The Panel was presented with examples of redeveloped brown field sites in other locations, but was unable to draw conclusions about their relevance without knowing contextual information such as the extent of the

original contamination, the degree of remediation carried out and surrounding land values.

It is probable that there would be significant areas of land suitable for industrial development within the proposed Port to Port corridor, without the development restrictions and ongoing liabilities associated with the Tar Ponds and Coke Ovens sites. CBRM agreed that the sites were not crucial to the Port to Port concept, provided that corridors for any new transportation links could be reserved.

Evidence was not provided regarding the added land development costs associated with building on the capped areas of the two sites, and the significance of those costs from a commercial perspective.

In earlier consultations community members supported development of recreation facilities and parkland on the sites, but CBRM has indicated that this does not mesh with their recreation strategy and that they do not have the resources to build or maintain these facilities. However, there is agreement on the concept of providing an active transportation link through the Coke Ovens and Tar Ponds sites.

The issue of habitat creation or restoration on both sites has received little attention through the assessment process, especially the possibility of combining partial estuarine / wetland restoration at the Tar Ponds site with solidification and stabilization, although STPA has indicated their intention to ensure viable fish passage through the extended Wash Brook Channel.

It is in the interests of all parties that viable future land uses that would maintain the integrity of the capped areas be established in a timely fashion to avoid the possibility that parts or all of both sites remain fenced after the completion of the remediation. Timing may be a

challenge. Future uses would ideally be determined and the resources to implement them would be secured in a manner that minimizes the time that the sites are left vacant, and even perhaps enable progressive reclamation or redevelopment to occur as different parts of the sites are remediated.

The issue of ideal bearing capacity objectives for the Tar Ponds site was not resolved during the hearings. Some presenters called for an increase in bearing capacity to increase the range of possible future uses. STPA indicated that this could be included in the Project at a relatively low extra cost and effort, but also pointed out that retaining a level of plasticity in the treated sediments also had advantages with respect to future site flexibility.

The importance of protecting and enhancing opportunities to establish treed areas on the two sites was discussed during the hearings. The Panel understands that urban design practitioners recognize the multiple advantages of trees in the city, including aesthetic properties, visual buffering, air quality, habitat, low maintenance, and shade. CBRM's MPS calls for the inclusion of treed buffer areas.

The Panel acknowledges and applauds the initiative taken by CBRM and other community stakeholders to address future use planning. The Panel also notes the willingness shown by STPA at the hearings to work with relevant stakeholders to integrate future use requirements into the detailed design stage of the Project. The Panel heard in the hearings that development of a viable future use plan would play an important role in increasing the acceptability of the remediation plan, mitigating some of the inevitable inconvenience, and improving the image of the Sydney area.

The Panel also heard that some sectors within the community see harbour-based economic development as the top priority, while

other sectors are more focused on community open space facilities that would contribute to health and well-being. The Panel does not see these two objectives as being incompatible; however, any future use planning process would need to integrate these different views and priorities while at the same time ensuring that the wider community has opportunities to have input, particularly the adjacent neighbourhoods (North End Sydney, Whitney Pier and Ashby).

Recommendation # 39

Future Use Plan

The Panel recommends that STPA, in collaboration with CBRM, develop a future use plan for the remediated Tar Ponds and Coke Ovens site that addresses the requirements of the evolving Port to Port Corridor concept, the community's interest in active living open space opportunities, the issues and concerns of adjacent neighbourhoods, the practical realities of the remediation process and subsequent monitoring and maintenance. The plan should draw on examples of best practice in brown field redevelopment wherever possible, and identify the resources necessary for implementation.

The MOA states that the \$400 million budget to be cost shared by the provincial and federal governments does not apply to future uses. If incineration is not included in the final Project, the application of any funds "saved" to future development plans or a possible legacy fund would be a political decision outside the mandate of the Panel. However the Panel believes that it is incumbent on STPA to integrate future use requirements into the remediation design in order to ensure that sustainable future uses are possible.

During the hearings, STPA indicated willingness to increase bearing capacity in

portions of the Tar Ponds site if required to support specific uses, to modify capping on both sites as required to support re-vegetation and to consider enabling the installation of site services to avoid having to subsequently excavate the cap and underlying materials. The Panel believes that such investments are a legitimate part of the remediation Project and that all possible steps should be taken through Project design to remove or overcome development restrictions caused by the continued presence of contaminants on site. This is particularly important given that, in the context of CBRM's current economic development situation, returns on land development in this area may not otherwise justify additional development costs associated with building on managed sites. The Panel observes that site enhancement measures are likely to be less costly if incorporated into the original remediation activity as opposed to being carried out after the fact.

Recommendation # 40

Minimizing Restrictions on Future Uses Through Site Design Enhancements

The Panel recommends that STPA, in collaboration with CBRM and other stakeholders review the Project design with respect to maximizing the capacity of the two sites to support a variety of future uses, as identified through the future use planning process addressed in Recommendation 39. The Panel further recommends that STPA incorporate all feasible site enhancements, such as bearing capacity and cap design improvements, and conduits for future site services, which fall within the designated funding.

The Panel observes that natural habitat creation or restoration should be a valuable component of the remediation process for three reasons:

- Such measures would be restorative in a social as well as ecological context, helping to heal the environmental damage and community stigmatization caused by past industrial practices;
- Natural aquatic and terrestrial habitat requires little or no ongoing maintenance; and
- Such habitats are also important for their aesthetic value.

NSDNR indicated at the hearings that STPA should address the mitigation of wetland habitat loss caused by infilling the Tar Ponds, either through avoidance, mitigation or, failing both of these, compensation through the restoration of adjacent wetland areas.

At the Tar Ponds, STPA proposes to replace Muggah Creek with a relatively narrow engineered channel. During the hearings STPA agreed that as planning progresses they would look at widening and naturalizing the channel. The Panel believes that for all of the above reasons STPA should refine the remediation plans for the Tar Ponds with the objective of maximizing the area of restored aquatic and wetland habitat, and minimizing the area of solidified and stabilized landfill. The Panel does not believe that new land creation in this area is of significant overriding value given the availability of adequate undeveloped lands near the downtown core. However, the Panel recognizes the need to balance restoration of aquatic habitat with the practical requirements of containing and solidifying the contaminated sediments.

The Panel believes that removal of the area of PCB contaminated sediments in North Pond would allow this area to be restored as aquatic habitat. Even if total encapsulation is eventually the preferred alternative, the channel should be widened and its shoreline naturalized to the greatest extent possible.

The Panel also observes that habitat restoration offers opportunities for community involvement. The interest in such involvement was demonstrated to the Panel during the hearings by way of the commitment of the staff and students of Sydney Academy to local environmental issues, and evidence of community-driven stream habitat restoration projects and other watershed protection initiatives.

Recommendation # 41

Maximizing Aquatic Habitat Restoration as Part of Future Use Planning

The Panel recommends that STPA, in consultation with NSEL, NSDNR, DFO and EC, develop a detailed habitat restoration plan for the Tar Ponds area, drawing the disciplines of remediation engineering and landscape architecture. The goal of the restoration plan is to increase the area of reclaimed estuarine habitat, while still enabling the effective encapsulation of contaminated sediments.

The Panel observes that, in the EIS, STPA commits to a very basic level of land restoration and re-vegetation. It was stated that the capped areas would most likely be unable to support tree growth. However in specific areas the surface capping could be enhanced to create the necessary depth for certain tree species, and 60% of the Coke Ovens site would not be capped.

Given that aesthetic and ecological contribution of trees in the urban landscape, the time it takes for trees to grow, and the community desire to “turn the negative of the Tar Ponds into as positive,” the Panel believes that the remediation plan should commit to a higher degree of land reclamation by creating a strategy to plant and nurture native tree species in appropriate locations as early as possible

during the construction phase. This may require enhancing the site cap in specific locations.

The Panel recognizes the need to coordinate this approach with the future use planning process. The Panel also observes that the implementation of an urban forestry approach on the two sites again offers opportunities for community participation.

Recommendation # 42

Tree Planting

The Panel recommends that STPA, in consultation with CBRM and other community stakeholders develop a native tree planting plan for both sites, together with a strategy for early implementation. The species of trees and shrubs selected should be compatible with the type of managed terrestrial ecosystem required to ensure the integrity of the caps. The Panel also recommends that STPA consider creating a native tree species nursery on site to provide the necessary planting stock which may otherwise be difficult to obtain.

The Panel believes that the development constraints on the remediated Tar Ponds sites, combined with an adequate supply of vacant industrial land in the vicinity, the original wishes of the community and the recommendations by health professionals, may mean that part or all of the remediated Tar Ponds site would be most suitable for recreational purposes that promote active healthy living. The Panel understands that, with judicious planning, this need not hinder the realization of the Port to Port Corridor concept. The Panel acknowledges CBRM’s financial constraints and current inability to fund the maintenance of new recreation or park facilities. The Panel observes that CBRM or a community organization may however be able to access

capital funds to help develop active living facilities.

The Panel believes that it is incumbent on STPA to maintain the integrity of the proposed encapsulation facility by ensuring that a viable and sustainable land use can be achieved on the site, without resorting to restricting public access. Therefore the Panel concludes that if the future use planning process concludes that the most viable use for the remediated Tar Ponds site is a low maintenance trail and open system, STPA should contribute to the cost of maintaining this facility from funds set aside for annual monitoring and maintenance for a period of 25 years.

Recommendation # 43

Maintenance of Community Open Space

The Panel recommends that, in the event that STPA and CBRM do not identify viable alternative commercial or institutional uses for the remediated lands site that are acceptable to the community, STPA be required by NSEL and PWGSC to set aside a portion of the annual monitoring and maintenance budget to contribute funds over a 25-year period to cost-share the operation and maintenance of a trail and open space system on the remediated lands. This set aside would be part of STPA’s responsibility to ensure the continued integrity and function of the encapsulation and drainage systems. If alternative land uses are pursued, the Panel recommends that sufficient land be set aside to provide an active transportation link between Whitney Pier and downtown Sydney, and that STPA ensure that remediation design (bearing capacity, cap design, soil cover etc) minimizes the cost of developing the facility.

6.5 EFFECTS ON LAND USE AND RESOURCES

6.5.1 STPA Assessment

STPA suggests that Project works and activities during the construction and operation phase could have an impact on existing land uses around the Project site as a result of noise levels, dust, air quality and odour. Offsite transportation activities, such as movement of fill and construction materials, are also cited as having potential land use impacts.

STPA maintains that upon completion of remediation activities, a positive effect on land use would occur as the sites become available for a variety of uses such as recreational, commercial or light industrial. This site redevelopment is also anticipated to stimulate development offsite in the wider community.

STPA has concluded that no significant adverse effects are predicted on existing land use during construction and operation of the Project. Following remediation a long-term positive effect on land use is predicted. STPA defines a positive effect on land use as an effect which “...would be supportive of the Municipal Planning Strategy designations and long-term land use objectives.”

The demand for construction materials including, clay, sand and gravel is expected to be significant for the Project. It is anticipated that the level of demand would be such that some material may need to be sourced off-island. STPA indicated that this could cause supply shortages and price increases which could have an adverse effect on other resource users. A beneficial effect is expected for resource suppliers. With respect to other resource uses, STPA has considered potential impacts to commercial and recreational fisheries and indicated that no significant effects have been identified.

6.6 COMMUNITY HEALTH AND WELL-BEING

6.6.1 STPA Assessment

STPA conducted an assessment of Project impacts on community health and well being focused on residents living or working within 2 km of the Project site. During construction on the Tar Ponds and Coke Ovens sites and during incinerator operations STPA suggested that some residents may perceive that the Project would pose human health risks. STPA indicated that perceptions of environmental health have been considered, and that the Project design presents remedial approaches that respond to these concerns. The remediation of the Tar Ponds and Coke Ovens site is expected to mitigate the community's perception of environmental health risks associated with the site's current status.

STPA indicated that the employment of between 375 and 435 people as well as Project effects on local education and training institutions would benefit the local community. The Project is also expected to have a positive effect on demographics through local employment opportunities.

STPA acknowledged that the Project may result in temporary inconveniences (noise and odours in residential areas), but indicated that these inconveniences are addressed through Project mitigation measures. Proposed remedial measures to address community health and well being include:

- Informing citizens of Project activities and progress;
- Implementing a dispute resolution policy;
- Informing health authorities of risks and developing a reporting system;
- Developing a master OHS plan;

- Implementing work stoppage when problems occur; and
- Undertaking risk communication activities.

STPA also told the Panel about its Community Engagement Program, intended to provide support to Project-related community initiatives intended to enhance beneficial effects and community involvement.

6.6.2 Government and Public Concerns

Many participants perceived that CBRM as a whole and Sydney in particular is living with significant stigma caused by the existence of the Tar Ponds and Coke Ovens and the failure of previous remediation efforts. This stigma is reinforced by Sydney's economic challenges and demographic decline, leading to an entrenched sense of marginalization. This stigma is seen as having negative effects on residents' sense of confidence and well-being and directly damaging Sydney's economic prospects. One business organization referenced a study commissioned to determine Sydney's image outside the region that confirmed this problem. Other presenters indicated that some professionals are reluctant to move to the city, and that contractors have found difficulty in obtaining insurance.

Successful completion of the remediation Project is seen as crucial to the removal of the stigma and Sydney's ability to move ahead. Some participants suggested that the containment approach would not be sufficient to address this problem because contaminants would remain on site. Others questioned whether the possible presence of ongoing contamination in areas outside the Project's boundaries would continue to affect the community's image.

The Panel heard from a number of presenters about the history of the Coke Ovens

in Sydney, the effects of the industry over the years on workers, their families and other residents, and also about difficulties experienced in adjacent neighbourhoods since the Coke Ovens shut down. Presenters paid tribute to the hard work and perseverance of community activists who struggled over the years to ensure that the need for a clean up of the contaminated sites was not forgotten, and spoke about the toll this took on individuals' health and family life.

Health professionals indicated that the pollution from the Coke Ovens, while in operation, had probably significantly affected the health of workers and residents. They also told the Panel that, post-closure, the industry has continued to affect some residents' health through the stress and uncertainty of living near a heavily contaminated site. In one case this has been documented through a study of stress reported by adolescents living near the Tar Ponds. The Panel heard that this stress has been exacerbated because CBRM already has a higher rate of cancer in its population than in comparable areas, and because of the national notoriety surrounding the Tar Ponds and Coke Ovens sites and past efforts to develop a workable remediation plan.

Health concerns were the main focus of a number of presentations and submissions. Individuals spoke to the prevalence of cancer, heart disease and other problems in their own families and in their neighbourhoods. They expressed fears that people living in the vicinity of the Tar Ponds and Coke Ovens sites were already weakened through past problems and through a build-up of contaminants in their bodies, and therefore more vulnerable to possible health effects that could be caused by remediation activities.

Residents living in Whitney Pier spoke about the stress and physical symptoms associated with past activities on the Coke Ovens site, such as the demolition of the by-

products building and removal of the Domtar tank; concern about contamination in backyard soils, basements and the Coke Ovens Brook; and their fears for the health of their children and pets. They told the Panel that they had experienced problems with dust, odours and volatile organic chemicals from the site in the past and that they expected further problems during the remediation, especially from work not carried under cover. They also spoke of the anxiety caused by seeing workers on site, only a short distance from their homes, wearing protective clothing.

Residents in this area had views and concerns regarding air quality monitoring in the past and questioned its adequacy to protect them. They had concerns about the type of equipment, its placement, when and for how long it would be operating, and the speed with which results could be obtained and how these would be reported.

Residents from the north end of Sydney had similar concerns about the proposed remediation. They spoke of living with the stigma of the Tar Ponds with its high fences and signs warning of health hazards, seeing visitors come to tour "the worst contaminated site in Canada," experiencing the odours from the Ponds, and witnessing the first, unsuccessful attempt at dredging and incinerating the contaminated sediments. They also spoke of loss of property value and damaging effects on rental and retail businesses. CBRM indicated that they had very recently adopted a secondary planning strategy for the North End focussing on its heritage buildings and hoping to increase residential development in the area once the remediation is complete. One submission told the Panel that JAG had originally proposed a property value protection program, modelled on an existing program in the Port Hope area in Ontario developed as part of a low-level radioactive waste management initiative. The author of the submission wanted to know why

this program had not been made a part of the Tar Ponds and Coke Ovens Project.

A number of presenters spoke positively about interactions with senior personnel at STPA, whom they found to be willing to listen and responsive. Nonetheless, lack of trust was a big issue for some local residents. People described past experiences with STPA, and what they perceived to be inadequate communications and access to information. They also expressed a fundamental concern about an apparent conflict of interest. The Province is seen as being, at the same time, the owners of the problem, the remediating agency and the chief regulator. Sydney's experience with the municipal waste incinerator was often cited as another reason undermining trust in the Province as regulator. Presenters told the Panel that the incinerator was out of compliance for extended periods of time but was allowed to keep on operating by NSEL.

Residents living in the vicinity of the Victoria Junction site and the proposed incinerator location also spoke about their past experiences with the coal washing plant, and what they felt were broken promises by the contractors to mitigate impacts of the plant, especially those caused by coal trucks on the Grand Lake Road. They spoke of the stress and uncertainty of having a hazardous waste incinerator in their neighbourhood, concerns about upset conditions and resulting emissions, and the fear of a catastrophic failure. Their concerns were shared by the owners of the local golf and country club. Some presenters questioned the likely effect of a nearby hazardous waste incinerator on recruitment of students to attend Cape Breton University. However, a committee of faculty from the university indicated that they were comfortable, based on review by their own expert, that such an incinerator could operate safely and would not affect the reputation of CBU.

With respect to the wider area of CBRM, some presenters told the Panel that the presence of an incinerator in the region would affect the socio-economic environment by being one more factor to dissuade professionals and business people and their families from relocating to what is already an economically depressed area.

Some presenters expressed their disappointment that the wishes of the community expressed during the JAG consultation that the cleanup should remove and destroy all contaminants from the two sites were not being honoured by the selected remediation strategy, and that the continued presence of contaminants would prolong the Tar Ponds stigma indefinitely. Similarly some told the Panel that contamination from the Coke Ovens was spread widely throughout areas of the community, and that the Project's boundaries were too narrow. Others disagreed, believing that delaying the remediation would have a much more deleterious effect on the community's reputation and sense of confidence and well-being. "Just get on with it" was a common theme.

CBRM indicated to the Panel that they strongly supported moving ahead with the remediation, as a vital part of rebuilding the region's image and economic strength, which in turn would help to slow or perhaps reverse the demographic drain, which would contribute significantly to community well-being. CBRM made it clear that they did not want to have an incinerator in the community, but were willing to endorse a total containment approach without incineration because they believed it was the only viable alternative to carry out the cleanup without lengthy delays.

Business organizations agreed with STPA that employment on the Project or related firms would be a major boost to the sense of community confidence and well-being, and

other presenters, while concerned about aspects of the remediation plan, also agreed that local participation in the Project's economic benefits were very important. However, it was pointed out that not everyone can be employed by the Project and that its beneficial and adverse impacts may be distributed unevenly.

Some people questioned the Agency's approach to community consultation through its Citizens Liaison Committee, which was seen as not being truly representative because it did not include some of the Project's more vocal critics, and because members were not communicating with the wider community. The net effect of this was to increase their distrust of STPA's accountability and the accuracy and timeliness of the information it provided to the community.

The Panel heard recommendations to address community well-being that included removing the incinerator component from the Project to minimize psychological stress and stigma; very stringent monitoring and reporting requirements and mandatory action levels; commitment to and resources for a future use plan; and a program to relocate, either temporarily or permanently, residents living adjacent to the Tar Ponds and Coke Ovens sites in order to create a buffer zone.

6.6.3 Panel Conclusions and Recommendations

The Panel recognizes that over the years community well-being in CBRM has been compromised by a combination of many factors. In the community as a whole, the high unemployment rate, rapid population decline, and a sense that the area cannot offer a future for many of its young people, have all taken their toll, though clearly mitigated by a strong sense of pride in and loyalty to the Island and confidence in the ingenuity and perseverance of Cape Bretoners.

In neighbourhoods close to the Tar Ponds and Coke Ovens sites (especially those areas that were originally downwind from the Coke Ovens stacks) residents have lived with additional anxieties about possible health and environmental effects from the contaminated sites, localized stigma associated with their proximity, uncertainty about whether or when remediation might take place, and stress associated with previous false starts. The Panel also acknowledges that the JAG process, although a bold initiative to involve the community as widely and democratically as possible in the decision-making process, was itself in some respects a drain on people's energies and by times a source of division and distrust.

The Panel recognizes that the presence of an incinerator in the community would inevitably be a source of anxiety and disquiet for some residents, although the Panel has concluded that, with stringent standards, regulation and monitoring, it should be possible to build, operate, regulate and monitor a modern incinerator with minimal impact and risk.

The Panel also recognizes that adjacent residents may experience noise, odours and dust at various times during the remediation, and that the length of the construction phase could exacerbate the effect of this on the community if it is perceived as much more than a passing nuisance.

The Panel believes that the following elements are needed to ensure that the Project ultimately has a beneficial effect on community well-being:

- The remediation must be carried out efficiently and effectively, in the least possible time;
- The remediation must be a permanent solution. To the extent that ongoing monitoring and maintenance is required,

institutional arrangements must be made to assure the community that the required resources would be available. Every effort should be made during the Project design stage to minimize future requirements for monitoring and maintenance;

- The remediation should be phased to demonstrate early progress, particularly in perimeter areas close to adjacent neighbourhoods. Progressive reclamation and landscaping should be carried out;
- If an incinerator is used to destroy some of the contaminants, its operators should be held to the highest standards, the provincial and federal governments should partner in regulating the facility, and the community should play an active role in its oversight;
- The Project's monitoring framework and programs should address community concerns, and be transparent and accountable. Monitoring results at certain preset levels should trigger mitigative actions. The community should have some form of independent oversight of the monitoring program;
- The regulators should incorporate opportunities for public review and input into key stages of the regulatory process;
- Ongoing communications and consultation programs should ensure that all key stakeholders are involved, and that in particular residents closest to the sites are informed in a timely fashion about Project plans, activities and any upset conditions;
- Local employment and other economic benefits should be maximized;
- The remediation should be carried on in such a way that viable and sustainable future uses can be established on the sites once the construction phase is completed; and

- All future uses, whether development, open spaces or naturalized land or waterscapes, should be based on sustainable principles to minimize the ecological footprint (i.e. resource and energy use and waste generation) of the new land uses and demonstrate both to CBRM residents and to the rest of Canada new environmental commitment to the future.

The Panel has addressed many of these issues through recommendations in other sections.

In addition, the Panel has considered the recommendation that a buffer zone be created around the Project sites and residents within the zone relocated either temporarily or permanently. The Panel has concluded that based on the mitigation measures proposed for the Project and the health risk assessment conducted for the EIS, buffer zones are not required during implementation of the Project. The Panel believes that effective monitoring and liaising with neighbourhoods around the Project sites and are worthy of consideration, specifically:

- To apply stringent regulatory requirements to abate all noise and air emissions so that acceptable standards are met at the boundary of the Project sites, and require STPA to apply all necessary design measures or subsequent mitigation to achieve this (see recommendations in Chapter 4); and
- To work with residents of adjacent neighbourhoods to identify and implement appropriate design features at or close to the perimeter of the sites that would mitigate or compensate for any unavoidable nuisance effects (these might include berms, contouring, special landscaping, look offs or trail connections).

Recommendation # 44

Perimeter Enhancement Strategy

The Panel recommends that STPA’s final Project design be required by NSEL and PWGSC to include a perimeter enhancement strategy to mitigate any interactions between the Project and local residents at the perimeter of the site and to add value to adjacent residential areas through added amenity at the interface area (landscaping, community facilities etc.). In the process of developing the strategy, STPA should consult with residents of the adjacent neighbourhoods through the Community Liaison Committee.

Overall, the Panel believes that STPA could enhance the Project’s contribution to creating a new image for Sydney and developing residents’ confidence that a corner has been well and truly turned, while at the same time creating real environmental value and setting an example to other areas.

6.7 PROPERTY VALUE

6.7.1 STPA Assessment

STPA considered the impacts of the Project on property values of both commercial and residential properties within the urban Sydney market as well as properties near the VJ and Phalen Mine sites. STPA predicted that once remediation is completed an increase in value is anticipated for urban Sydney properties.

The assessment of property value impacts around the Tar Ponds and Coke Ovens sites considered the areas of Whitney Pier, the North End, Downtown, Ashby, the South End, Kings Road, Boulderwood, Sydney River, Coxheath, and Westmount. The assessment area around the proposed incinerator sites included

the Grand Lake Road area, River Ryan, Lingan, Scotchtown, and New Waterford.

STPA considered that the Project would have no significant adverse effect on property values if any decrease in market value that occurs during the remediation Project is less than any increases that would occur post-remediation.

Research conducted by STPA has suggested that environmental remediation Projects can affect property values due to concerns over health risk and public image.

A model was developed for assessing current impacts to property values and the results provided in the EIS indicate existing impacts ranging from 13% for properties within 100 m to 0.15% for those properties beyond 1km from the sites. For those areas assessed in the vicinity of the Tar Ponds and Coke Ovens sites the construction phase of the Project is predicted to have no more than a 1% impact for Projects immediately adjacent to the site and along heavy equipment routes. Following construction a positive effect is anticipated to recover the current property value impacts of 13% to 0.15% identified through the model. Redevelopment of the sites is expected to provide further increases in property values.

Adverse effects on property value are anticipated in the vicinity of the incinerator during operation. STPA suggests an impact of no more than 2% to 3% for properties nearest the site. The extent of this impact would be dependent on the strength and pervasiveness of negative perception held by property buyers. No impacts are anticipated during the decommissioning stage.

STPA has proposed to confirm predictions of the assessment on property values by rerunning the property valuation model every two years during Project construction and

operation. The intent is to determine actual impacts of the Project on property values.

6.7.2 Government and Public Concerns

The Panel was told by residents in both Whitney Pier and North End areas that they are concerned that the Project would have negative effects on the already depressed value of their properties, and on their ability to either sell or rent their homes. This could lead to a feeling of being trapped. One submission raised the question of whether there should be a property value protection program put in-place. The accuracy of the property value assessment model was challenged, as was the extent of STPA's consultation with the realty sector.

6.7.3 Panel Conclusions and Recommendations

The Panel understands that owners of properties close to the Tar Ponds and Coke Ovens sites have already experienced significant devaluation, because of the proximity of the contaminated sites. The Panel also concludes that, once the remediation of the sites has been completed, and particularly after the future uses have been established, property values are likely to rebound to a certain extent.

The Panel notes that comparisons to other locations in the EIS may or may not be totally applicable to CBRM where the real estate market is already significantly depressed because of population decline. The Panel observes that STPA has predicted a small further decrease in values closest to the sites and proposes to monitor the accuracy of this prediction. No specific mitigation is proposed, other than measures designed to minimize the effects of noise, air emissions and transportation on adjacent neighbourhoods. The Panel notes that the property valuation model requires price information from recent property transactions

and questions whether such transactions would in fact take place in the areas closest to the site.

The Panel also observes that while property value decreases due to the active remediation may be temporary, the construction period would last between 5 and 8 years at the Tar Ponds and Coke Ovens sites, which is a long time to wait for the realisation of eventual gains, especially if these gains are uncertain.

The Panel is concerned that if monitoring shows that property values have been depressed by the remediation activity substantially more than 2% to 3%, further mitigation of Project effects may not (a) be possible or (b) effective in increasing values again.

The Panel has recommended the development of a perimeter enhancement strategy be implemented as early as possible in the process and that a future use development plan be developed. The Panel believes that both these measures could help to counter negative effects on property values. However, the Panel believes that STPA needs to develop further mitigation measures to be applied if monitoring shows changes beyond limits deemed to be acceptable. The Panel therefore believes that STPA should develop a property value protection program to be applied within those areas closest to the sites and most likely to experience considerable nuisance effects and inconvenience.

Recommendation # 45

Property Value Protection Program

The Panel recommends that STPA, in consultation with CBRM, be required by NSEL and PWGSC to develop a property value protection program to be applied to properties in the immediate vicinity of the remediation sites and at most risk of being

affected by noise, odour, dust or transportation.

6.8 HERITAGE RESOURCES AND TRADITIONAL USES

6.8.1 Archaeology and Heritage Resources

STPA in the EIS stated that mitigation measures outlined in the EIS provide for Project planning and increased knowledge of archaeological and heritage resources. “The area on the west side of Muggah Creek would be monitored by a professional archaeologist during the construction phase.” The north end of Sydney was part of Sydney’s early development. Maps contained in a Heritage Resources Impact Assessment conducted in June 2000 during the installation of interceptor sewer infrastructure near Battery Point shows significant community development in the north end dating back to 1794. As well, the Mi’kmaq Ecological Knowledge Study (MEKS) provided detail of prehistoric settlement in the close proximity to Muggah Creek. The Panel agrees that this warrants the level of monitoring for archaeology and heritage resources proposed during the construction phase of the Project.

Monitoring and contingency planning identified by STPA for inclusion in the Environmental Management Plan for the Project would provide STPA the information necessary to manage unexpected discovery of items of interest. The Panel believes that this could contribute to positive outcomes as determined by STPA in the EIS. The Panel is also of the view that appropriate government, academic and community interests should be made aware of monitoring programs and contingency plans related to heritage resources.

Recommendation # 46

Contingency Planning for Heritage Resources

The Panel recommends that when STPA develops the contingency plan related to archaeology and heritage resources to be included in the Environmental Management Plan, this information should be shared with parties with an interest or a potential role to play upon discovery of items of significance. These include First Nations representatives, government, academic and community interests.

6.8.2 Traditional Uses

STPA addressed effects on traditional uses through the Mi’kmaq Ecological Knowledge Study (MEKS) submitted by STPA as part of the EIS. The report was completed in cooperation with Membertou First Nation, through the services of Membertou Geomatics Consultants. The report indicated that because the Tar Ponds and Coke Ovens sites had been an industrial area for over a hundred years, and because of their contaminated status, there are no traditional hunting areas or sites located nearby, and therefore the Project is expected to have minimal impact. The Panel accepts the conclusion of the MEKS that the Project would not result in significant adverse environmental effects on traditional uses.

A representative of Membertou First Nation told the Panel that governments had a duty to consult with First Nations in regard to the Tar Ponds and Coke Ovens Project, that in this context, “consultation” has a specific meaning and requirements, and that this consultation had not yet taken place. The Panel concludes that this issue lies outside the Panel’s mandate.

7 CUMULATIVE EFFECTS

7.1 STPA ASSESSMENT

STPA's process for assessing cumulative environmental effects involved five steps:

- Scoping the cumulative effects assessment;
- Analyzing cumulative effect(s) on the VEC;
- Developing tools and approaches to mitigate cumulative effects;
- Determining significance of residual cumulative effects; and
- Developing follow-up and monitoring measures to verify effect predictions and effectiveness of mitigation measures.

The EIS Guidelines stated that a “baseline environment is the condition that exists prior to Project development.” Therefore, STPA's baseline description characterized the environment as it had been affected by past and current human activities. As such, cumulative effects of past and current activities were reflected in that baseline information. To assess cumulative effects, STPA focused on future Projects and activities in two categories: those that are a) planned and certain to take place or b) reasonably foreseeable. These were based on their potential to affect the same VECs within the local or regional study areas.

STPA stated planned / certain Projects are those that have a high probability of being implemented, i.e., those that have already been approved or are under review by appropriate agencies, or have been announced publicly as imminent developments. Reasonable foreseeable Projects and activities are probable to be implemented and typically include those identified in approved development plans or those that are in other advanced stages of planning.

STPA indicated that due to limited specific information on individual Projects, it was not possible to predict and describe the cumulative effects in the same way that direct effects were addressed. Instead the assessment remained largely qualitative in nature and was based on professional judgement and experience with similar Projects, using plausible, yet conservative assumptions. STPA indicated this was particularly true for “reasonably foreseeable Projects and activities.” Where available and applicable, STPA used regulatory standards and guidelines to discuss the potential for adverse cumulative effects.

In order to assess potential cumulative effects, STPA considered whether any anticipated residual Project effects after mitigation measures could act in combination (that is, cumulatively) with other Projects and activities to adversely affect VECs. STPA concluded that the Project would have few residual effects remaining to interact with other Projects and activities to cause cumulative effects within the identified spatial and temporal boundaries.

STPA stated that the lack of predicted cumulative interaction with other sources is largely a result of the relatively limited spatial extent of effects, and the relatively short duration of the Project. The most significant single source of air emissions in the area is the Lingan coal fired generating plant, where a proposed sulphur dioxide scrubber would reduce the sulphur dioxide exposure levels and particulate matter levels throughout the region. The quantitative impact of this is not known; but the impact would be a net reduction in existing, and potentially cumulative, levels of sulphur dioxide within the regional air shed. STPA conducted a separate cumulative effects assessment for ten other Projects for which potential cumulative effects were identified.

STPA indicated that since the prime objective of the Project is to improve environmental conditions, only beneficial cumulative effects were identified.

7.2 GOVERNMENT CONCERNS

Both Environment Canada and Health Canada questioned whether STPA had provided enough cumulative effects information on the expected results of combining existing air quality with effects on air quality resulting from remediation and incineration. Specifically, Environment Canada questioned whether the predicted concentrations at the Tar Ponds and Coke Ovens sites presented in response to an information request included emissions from the proposed incinerator. Environment Canada indicated that an estimate of the total ambient concentrations, once the emissions of the proposed activities are added to the pollutants currently present in the air shed was needed. Environment Canada also told the Panel that it appeared that only selected pollutants have been assessed for cumulative effects.

STPA responded that because of the proximity of the VJ site to the Tar Ponds and Coke Ovens sites, that there could be a perceived overlap and therefore a perceived increase in cumulative affects. However, STPA stated that the cumulative effects assessment did not factor in incinerator emissions because the concentration of air emissions from the incinerator would be inconsequential by the time they reached the Tar Ponds and Coke Ovens sites. STPA indicated that they included

in the cumulative effects assessment all of the air quality constituents for which measured or monitored data was available and for which there were criteria that could be compared against to see whether they exceeded recommended levels. STPA stated that there were only a limited number of constituents that have criteria that could be used in the assessment.

7.3 PANEL CONCLUSIONS

Where relevant, the Panel has addressed issues related to specific VECs and cumulative effects in other sections of this report – for example, addressing the contribution of the Project to beneficial cumulative effects in Sydney Harbour is discussed in Chapter 4. In assessing significance, the Panel notes that in many cases thresholds or guidelines and objectives for evaluating effects, including cumulative effects on VECs, are non-existent. In these situations, the Panel has considered STPA's criteria such as magnitude, duration, spatial extent, probability, permanence and professional judgment.

The Panel believes that although STPA's approach to examining the issue of cumulative effects was not supported in all cases by quantitative baseline information, the approach was adequate. Given the nature of the Project, STPA's proposed mitigation measures, the recommendations of the Panel, and the limited extent of any residual effects, the Panel concludes that significant adverse cumulative effects of the Project are unlikely.

8 ENVIRONMENTAL MANAGEMENT

8.1 THE REGULATORY CONTEXT

Upon successful completion of the environmental assessment process, regulatory authority for the Project would be the shared responsibility of the federal and provincial governments. CBRM could have some involvement with respect to land-use restrictions and other authorizations. The Panel observes the following with respect to regulatory responsibility.

For this Project, responsibility for environmental protection at the federal level would potentially be divided among a number of agencies including Environment Canada, Fisheries and Oceans Canada, and Transport Canada.

Permitting may also be required from Environment Canada under the *Canadian Environmental Protection Act (CEPA)* for disposal of sediments in the marine environment, as well as a Ministerial Authorization for the operation or testing of a mobile PCB treatment or destruction system if this were to take place on federally owned lands.

STPA would likely be required to comply with a number of other federal statutes including: the *Fisheries Act*; *Canadian Environmental Protection Act*; *Transportation of Dangerous Goods Act*; *Canada Shipping Act*; *Migratory Birds Convention Act*; *Species at Risk Act*; and the *Federal Real Property Act*.

The Panel is aware that no federal agency holds regulatory authority for permitting the entire Project. The Panel did note that a number of federal agencies expressed an interest in participating in the review of permits required by the provincial government.

Nova Scotia Environment and Labour (NSEL) is the lead provincial department for environmental protection and management. The *Environmental Assessment Regulations* and *Activities Designation Regulations* pursuant to the *Environment Act* identify specific activities that require approvals. In addition to issuing approvals, NSEL is also responsible for compliance monitoring and responding to environmental emergencies.

The Panel is aware that provincial environmental assessment requirements for the Project have been addressed through the Joint Panel Review process. Following submission of the Panel Report, the Minister of Environment and Labour would make a decision on the Project. A decision to approve the Project may be accompanied by terms and conditions as determined by the Minister.

With an approval from the Minister of Environment and Labour at the environmental assessment stage, the Project would be subject to additional approvals required for various Project components. The *Activities Designation Regulations* identify specific activities that require approvals including but not limited to: watercourse and wetland alterations, culvert installations, hazardous waste treatment, water and wastewater treatment, and sulphide-bearing material disposal.

During the hearings NSEL indicated that, based on existing Project details, approvals issued by the department would cover the following activities:

- Rerouting and control / treatment of groundwater and surface water;
- Excavation, ex-situ treatment of PCB and PAH contaminated sediments and soils;

- Destruction of PCB contaminated waste by incineration;
- In-situ solidification / stabilization of PAH contaminated sediments;
- Landfarming and bioremediation of surface soils;
- Management of conventional solid waste;
- Engineered capping and containment systems;
- Decommissioning of Project infrastructure; and
- Long-term site monitoring and maintenance.

In addition to receiving required approvals, STPA would also be required to comply with a number of NSEL administered regulations addressing air quality, handling and transport of dangerous goods, petroleum management, water and wastewater.

STPA would be required to comply with provincial statutes and regulations administered by departments other than NSEL. These include the *Special Places Protection Act*, *Beaches Act*, and the *Endangered Species Act*. Under the *Beaches Act* an approval may be required for construction activity that occurs between the high and low tide mark of a marine estuarine environment.

Nova Scotia Environment and Labour's mandate also includes responsibility for worker health and safety. Health and safety in the workplace is protected by Nova Scotia's *Occupational Health and Safety Act* and *Regulations*. STPA would be required to submit an Occupational Health and Safety Plan and comply with the *Act* and *Regulations*.

Federally STPA is required to comply with the Canada Labour Code for federally regulated work environments such as marine based activities (vessel operation) or inter-provincial rail transportation.

The current ownership of the Project sites creates some uncertainty with respect to regulatory authority. The Tar Ponds are primarily owned by the Government of Canada while the Coke Ovens site is primarily provincial crown land. The VJ and Phalen sites are owned by CBDC, a federal crown corporation. While it is understood that the Province would assume full ownership of the Tar Ponds and Coke Ovens sites following remediation, the Province's authority to regulate activities on the federal portions of the sites during remediation is not clear.

The federal government's authority may extend to all areas of the Project; however there is virtually no mandated regulatory role for the federal government over the remediation activities that would occur on these sites. The one exception would be an approval required for the incinerator, but only if the incinerator site remained under federal ownership. STPA has indicated that CBDC intends transfer the incinerator site to the Province before construction.

While the EIS indicates that CBRM has a range of bylaws that may have application to the implementation of the Project, it is uncertain how CBRM bylaws apply to lands that are owned and managed by the provincial and federal governments. During the hearings CBRM indicated that it had commitments from STPA that municipal bylaws would be followed as the Project developed; however, the Panel also heard some concerns from the municipality with respect to their ability to administer land use controls over the remediated sites.

STPA has identified three international agreements which could influence the Project. The Stockholm Convention on Persistent Organic Pollutants (2001), the Kyoto Protocol (1997), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979).

8.2 GOVERNMENT AND PUBLIC CONCERNS

Representatives of both the federal and provincial governments indicated at the hearings that they have had long involvement with the Tar Ponds and Coke Ovens sites and the process leading to the development of the Project under review.

It was made clear to the Panel that, notwithstanding a number of federal approvals that would be required at the outset, the main regulatory responsibility for the ongoing Project lies with the Province. The federal government, through the agency of a federal Crown corporation (CBDC), owns the VJ site where the incinerator would be located but intends to turn these lands over to the Province before construction of the facility begins. This means that the *Federal Mobile PCB Treatment and Destruction Regulations*, currently under revision, would not apply to the Project. The Province does not have comparable regulations and this was raised as a concern by a number of presenters. A representative of Environment Canada agreed when questioned during the hearings that the “optics” of this land transfer were not that good, but that he expected that the Province would apply comparable standards.

Otherwise, the main regulatory tool wielded by the federal government would be enforcement of section 36 of the *Fisheries Act* with respect to preventing substances deleterious to fish from entering waterways frequented by fish. This would require that any effluents discharged by STPA would need to be capable of meeting the pollution prevention requirements under the *Fisheries Act*.

Environment Canada also made it clear that they and other federal departments possess relevant scientific and technical capacities, and that part of their mandate is to share that

expertise with the provinces as required. Therefore Environment Canada is prepared to work with the Province of Nova Scotia in a collaborative manner to ensure the most effective approach to regulation and compliance enforcement. A technical working group is already in-place.

There was some discussion at the hearings as to which federal departments or agencies would eventually be Responsible Authorities (RAs) under the CEAA, with a mandate to oversee the follow-up program. At the time of the hearings the RAs were PWGSC because of their involvement in managing funding through the Memorandum of Agreement, and Environment Canada because the proposed incinerator site is currently owned by CBDC and therefore the *PCB Mobile Treatment and Destruction Regulations*, administered by Environment Canada, would apply. However, if and when this land is transferred to the Province, Environment Canada would no longer be an RA, unless it had been determined that the remediation work in the Tar Ponds would be subject to a Disposal at Sea permit.

The Panel also heard that a recent change to the *Canadian Environmental Assessment Act* has made crown corporations such as CBDC subject to the terms of the *Act* and therefore CBDC could become an RA should Project activities begin on any properties owned by them, such as Mullins Bank, the VJ site or the alternate Phalen Mine site, before they have been transferred to the Province.

NSEL indicated to the Panel that they are currently considering how best to approach regulation of the Project. Various approvals would be required under the *Environment Act*, but NSEL may also have an option of rolling these into one overall Project approval. One consideration would be how such an arrangement would affect the ability to apply

stop orders to the Project, should this be necessary. Approvals issued by NSEL would likely be given for a ten-year period, after which they would need to be renewed. STPA would be required to have a provincial approval for the Project through both the construction and the monitoring phases of the Project. Where no specific provincial regulations or standards exist, NSEL reviews each undertaking under the *Environment Act* on a case by case basis, adopting standards or performance criteria from other jurisdictions as appropriate.

NSEL told the Panel that they would be seeking standardized documentation of the site management plan, including the remedial objectives, remedial action plan, risk management plan, monitoring plan and a site closure plan. NSEL has been involved in various prior approvals. They look for protocols regarding the response to exceedances, procedures for contractors including early warning systems to ensure compliance, and a comprehensive occupational health and safety plan. NSEL also indicated that, over the life of the Tar Ponds Project so far, they have learnt about the crucial importance of establishing early warning systems to identify and correct problems as quickly as possible, the need to create a suitable “consciousness and culture among employees,” and to inform the community in timely fashion.

NSEL is expecting to work closely with the federal government on the regulatory regime but has not yet made decisions about adopting federal criteria or standards. They intend to be as “seamless” as possible in cooperating with other levels of government. NSEL is also expecting to dedicate additional staff to the task who would be out “on a daily basis.”

NSEL told the Panel that they have a range of tools by which they can enforce compliance (or penalize lack of compliance) which include issuing a summary offence ticket

for small offences, bringing a prosecution under the *Environment Act* or suspending Project approvals.

There was some discussion about regulatory complexities that may arise given that part of the Project would be carried out on federally owned lands, before they are transferred to provincial ownership at the end of the construction phase. The Panel was told that provincial regulations are not generally applied to federal properties. Therefore much of the Tar Ponds solidification and stabilization would be occurring on federal Crown lands. A significant portion of the Coke Ovens site is owned by CBDC, and while no active remediation is slated for this area, there would still be numerous Project activities taking place.

The Panel learned during the hearings that Health Canada has no regulatory role. However, a representative from the provincial Medical Officer of Health’s office informed the Panel that under the new *Health Protection Act*, the Medical Officer of Health can, if necessary, conduct risk assessments, monitoring and auditing, and can formally advise the public of any health concerns. This last step can be carried out in various ways, such as public notices or advisories to medical professionals, and is seen as potentially a powerful tool. While the MOH office does not anticipate carrying out its own studies in this case, they do expect to NSEL to involve them during the permitting stage. The MOH office is expecting public health staff resources to double during the next five years.

STPA had indicated in the EIS that institutional controls such as land use by-laws and deed restrictions might be needed to control future uses in such a way as to protect the environmental management structures and functions on the remediated sites, including the integrity of the capping systems. These controls would be the responsibility of municipal

government. The Panel questioned representatives of CBRM with respect to any concerns they might have about this responsibility. CBRM informed the Panel that they have misgivings about this approach, believing that transferring ownership of the capped lands to private owners with deed restrictions would raise enforcement challenges and might not deliver the required protection.

From community representatives and other organizations the Panel heard scepticism about the ability of the Province to effectively regulate the Tar Ponds and Coke Ovens remediation. This was largely based on two concerns – the fact that a provincial department would be regulating a provincial agency, and NSEL’s track record in CBRM.

Some presenters indicated that they saw a significant conflict of interest, given that the Province is both owner of contaminated areas and the regulator. A specific concern was raised about Transportation and Public Works’ joint role as “owner” of the Project (department responsible for STPA) and regulator of the transportation of dangerous goods. It was also apparent during the hearings that some questioners were surprised that federal departments such as Environment Canada and Fisheries and Oceans did not in fact have a bigger regulatory role.

The unease about the joint provincial responsibilities appeared to be exacerbated by a lack of trust in NSEL’s enforcement capabilities based on their past performance with respect to environmental issues in Sydney. The Panel heard detailed testimony about the failings of municipal solid waste incinerator, which was allowed to continue operating out of compliance with its permit for several years and caused much local concern about air emissions and possible health effects. NSEL did not dispute the facts of this situation, indicating that most of the difficulties stemmed from the changes in

feedstock being burned due to new solid waste regulations, and that the incinerator was not shut down because there were no alternative disposal options for the wastes at that time.

Concerns were also raised about the possibility that the terms of Project approvals could be subsequently altered to accommodate STPA’s inability to achieve compliance. NSEL indicated in response that this would clearly not be their intention but that there are provisions allowing a proponent to apply for a variance.

From a representative of the health sector, the Panel heard a recommendation that a specific Act of the Legislature should be passed to govern the Tar Ponds and Coke Ovens remediation throughout its life, to help build community confidence. This recommendation was made mainly in the context of monitoring, reporting and the provision of funds past the lifespan of the Memorandum of Agreement funding.

Some presenters questioned whether the proposed Project, and particularly the total encapsulation alternative, complied with the Stockholm Convention on Persistent Organic Pollutants because PCBs would remain in the Tar Ponds monolith. In the case of the alternative, there would be PCB concentrations in excess of 50 ppm. However, representatives from Environment Canada indicated that the Stockholm Convention, while promoting removal and destruction, also permits countries to take a risk assessment and management approach if PCBs can be safely controlled in-situ.

8.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

The Panel believes that the Tar Ponds and Coke Ovens remediation Project presents a significant regulatory challenge for the following reasons:

- The Project is the largest remediation undertaking ever carried out in Nova Scotia;
- Both federal and provincial properties are involved. The transfer of land does not occur until the conclusion of the construction phase. The Panel has been assured of the intent to cooperate but has not been presented with information about a proposed cooperative regulatory model;
- NSEL would not normally expect to regulate activities on federal lands;
- The remediation involves a variety of technologies and activities taking place on three sites. NSEL has no prior experience with regulating solidification and stabilization applications. NSEL’s experience with regulating incinerators in the local area has been controversial;
- Even at the federal area there has been limited experience with these particular remediation technologies;
- NSEL would be in a position of regulating a provincial agency that reports to a considerably larger government department (NSTPW). There would be significant pressures on all parties to complete the remediation in a timely fashion. At the very least this may create a perception that NSEL’s ability to enforce compliance in an independent and vigorous fashion could in some circumstances be compromised;
- The history associated with Tar Ponds and Coke Ovens remediation attempts has eroded public confidence. The Panel understands that STPA has been working hard to dispel distrust, but believes that it is still likely to be factor in the regulatory context;
- STPA told the Panel at the beginning of the hearings that they believe that it would eventually be possible to “walk away” from the Project – in other words,

there would be no need for further maintenance or monitoring – but provided no persuasive evidence as to exactly when that might be. It is possible that some or all of the remediated areas must be managed and regulated in perpetuity; and

- If ownership of parts or all of remediated sites were transferred to private ownership, CBRM would be tasked with developing and enforcing institutional controls, without necessarily having the resources or technical capability to do so effectively.

The Panel observes that STPA would be required, through the environmental assessment and subsequent approvals process, to develop and file numerous plans. The Panel believes that it should also be incumbent on the federal and provincial governments to prepare a regulatory plan for the Project, and then to commit to the plan through a Memorandum of Agreement. The purpose of the plan would be to address coordination issues upfront; ensure that both levels of government share their skills, knowledge and experience; define applicable approvals; ensure that the same standards apply to all parts of the sites, no matter who owns them; establish an effective compliance enforcement model for the Project; provide STPA with a clear regulatory roadmap to follow; and – very importantly – give the community, in a single document, a unified statement of the way in which the Project would be approved and permitted, the standards to which it would be upheld, the measures taken to ensure this happens, and the opportunities for ongoing public review and comment.

The regulatory plan also needs to address how other departments with relevant scientific and technical expertise in each government, besides Environment Canada and NSEL, would participate in the regulatory process.

The Panel has considered the issue of whether the Project is best regulated by NSEL through one unified approval or through separate approvals. The Panel is inclined to think that one approval would be preferable, but with provisions allowing the Minister to issue a stop order for one part of the Project, should this be necessary, rather than the whole Project. However, the Panel believes that this is best worked out during the process of developing the regulatory plan referenced below.

Recommendation # 47

Federal-Provincial Regulatory Plan for the Tar Ponds and Coke Ovens Project

The Panel recommends that before the Project construction begins, the federal and provincial governments prepare a coordinated regulatory plan for the Project and commit to it by signing a Memorandum of Agreement. The regulatory plan should address the following issues:

- **A formal collaborative process between the federal and provincial governments to (a) share expertise and (b) coordinate relevant regulatory processes;**
- **How the regulation of construction phase activities on both the federal and provincial portions of the sites would be coordinated;**
- **Regulations, guidelines, standards and criteria to be applied to activities, emissions and discharges;**
- **Compliance and effects monitoring;**
- **Proponent reporting requirements;**
- **Inspection and auditing procedures;**
- **Staff and other resources;**
- **Enforcement responsibilities and procedures;**
- **Process required to amend the regulatory plan;**

- **The requirement for an annual Regulators Report to the public; and**
- **Opportunities for public review and feedback.**

Recommendation # 48

Federal Expert Advice

The Panel recommends that PWGSC seek assistance from Environment Canada, Health Canada, Fisheries and Oceans Canada, and Natural Resources Canada to ensure that mitigation measures and a follow-up program are implemented.

The Panel was intrigued by the recommendation that a provincial act be passed to ensure commitment at the highest level of provincial government to the ongoing management, maintenance and monitoring of the Tar Ponds and Coke Ovens sites after the construction phase is complete. This recommendation was presented in the context of addressing public uncertainty and anxiety over the remediation Project, given that contaminants would remain on site for a very long time, and that the encapsulation technologies would require ongoing care and maintenance.

One of the big challenges of remediation Project that lasts for twenty years or more is that corporate memory (and even community memory eventually) would gradually be lost as today’s key players in the development; assessment and regulation of the Project age and retire. STPA may be closed down and its responsibilities folded into those of a provincial department at some point. Also government priorities would inevitably change, and new and pressing issues come to the fore. Specific legislation addressing management requirements, responsibilities, resources, and reporting would bind the government to ensure that ongoing maintenance and monitoring occurs until such time as the contaminants left

on site no longer pose a risk and the “walk away” solution promised by STPA has been reached.

The Panel believes strongly that our generation has a duty not to encumber future generations with incremental environmental problems. The federal and provincial governments have decided to pursue partial containment rather than total removal and destruction (and possibly may eventually opt for the full containment alternative). Therefore both governments have a responsibility to ensure that (a) all steps are taken to prevent long-term failure of the containment system through neglect, and (b) the community would not incur costs of repair or restoration many years down the road.

Recommendation # 49

Tying Funding to Technology Testing

The Panel recommends that the Project’s funding partners implement a performance-based funding process that would see the dispersal of funds being tied to the:

- **Successful testing of solidification / stabilization (Recommendations 12 and 13);**
- **Successful testing and operation of the incinerator; and**
- **Successful implementation of mitigation measures.**

Recommendation # 50

Tar Ponds and Coke Ovens Remediation Maintenance and Monitoring Act

The Panel recommends that, before the completion of the construction phase at the Tar Ponds and Coke Ovens sites, the Government of Nova Scotia enact legislation

to address the long-term management, maintenance, monitoring and reporting required to ensure that the containment and water control and treatment systems on the remediated sites are maintained and monitored for as long as the contaminants remaining on site present a potential risk to people or the environment. The Act should include provisions for reporting and accountability. The Act should specify under what conditions maintenance and monitoring can cease.

The Panel also shares CBRM’s unease with the prospect that the Tar Ponds remediated site or the capped portions of the Coke Ovens site might be transferred into private ownership while active maintenance and monitoring is still required and while the integrity of the cap itself must be maintained in order to protect the function of the encapsulation system. The Panel recognizes that development and enforcement of institutional controls is an added responsibility for which the municipality is not currently prepared. The Panel also questions the likely effectiveness of such controls in the local context where the real estate market is depressed and land values may not warrant significantly higher development costs.

The Panel therefore believes that the remediated sites should remain in the ownership of the provincial government until such time as monitoring indicates that pre-established benchmarks have been met and that the integrity of the capping system no longer needs to be maintained to ensure that the site does not present a risk to human or ecological receptors.

Recommendation #51

Provincial and Federal Ownership of Remediated Lands

The Panel recommends that the capped portions of both the remediated Tar

Ponds and Coke Ovens site remain in provincial or federal ownership until such time as the integrity of the cap is no longer a requirement as defined in Recommendation 10.

8.4 ENVIRONMENTAL MONITORING AND FOLLOW-UP

8.4.1 STPA Assessment

STPA has committed to develop monitoring programs for environmental effects and environmental compliance. STPA indicated that they would be responsible for monitoring programs and that the programs would be integrated into contractual arrangements with the contractors.

Specific monitoring objectives include ensuring that operational requirements and remediation objectives are met; assisting in verifying effects predictions in the EIS; confirming proper implementation and effectiveness of mitigation measures; determining the need for new or altered mitigation measures; and ensuring compliance with regulatory requirements. The intent is to incorporate these monitoring programs into an overall Environmental Management Plan (EMP).

STPA has structured environmental effects monitoring (EEM) programs based on potential effects identified through the assessment. The programs would be organized around the three phases of the Project including: pre-construction phase (2006); construction phase (2007 through 2014); operational phase (2015 and beyond). Pre-construction monitoring would be used to supplement or strengthen baseline data, while construction and operational phase monitoring would serve to test and confirm EIS predictions and verify mitigation effectiveness.

Environmental compliance monitoring (ECM) would be conducted on a continuous basis during the construction and operation stages to ensure compliance with conditions of approvals and permits as well as other commitments made to regulatory agencies. STPA intends to track environmental compliance issues using a system of daily reports and incident reports made available to regulatory agencies and the public. Incident reports would be followed up with corrective measures.

STPA intends to develop detailed monitoring programs in consultation with regulatory agencies and considering recommendations generated through the environmental assessment process and ongoing public consultation. Monitoring programs would be subject to ongoing review by stakeholders throughout the life of the Project and modified as required. Adaptive management would be incorporated into monitoring programs to respond to Project issues or evolution of the Project with time.

STPA has expressed its intent to develop reporting mechanisms for the public that would allow easy access and ensure information is presented in an appropriate manner. A number of options have been discussed including web based access, information kiosks, storefront facilities, and newsletters.

STPA has indicated that funds for monitoring have been allocated within the \$400 million overall Project budget. The latest cost figures provided to the Panel during the hearing process indicated that \$55.5 million was allotted to environmental monitoring and maintenance. This allotment is understood to cover a period of up to 25 years following the ten-year work period for the Project. According to STPA, future allocation of funds to cover costs of any required monitoring after the 25 years falls outside their mandate; however, it is recognized

that additional monitoring may be a requirement beyond the 25 years. During the hearings STPA indicated that at the end of 25 years there would be a reassessment of the success of the Project and determination of the need for further monitoring or actions.

In addition to monitoring the Project during construction and operation, a follow-up monitoring plan is required in accordance with the *Canadian Environmental Assessment Act*. The development and implementation of the follow-up program is the responsibility of the federal RAs.

In response to an information request put forward by the Panel, STPA provided a draft air monitoring plan overview, which they said indicated “the structure and content of future monitoring programs.” The program included information on overall approach, objectives, technology, placement, sampling and analysis methods and contaminant levels that would result in specified mitigation actions.

8.4.2 Government and Public Concerns

From many government departments the Panel heard that adequate monitoring is a key Project requirement in order to ensure that predictions are verified, that mitigation can be applied if necessary in a timely and effective manner, and to find out if the Project is having any unexpected effects.

Environment Canada expressed concern about the lack of detail in the EIS and pointed out that if monitoring information is to be provided in the revised Environmental Management Plan (EMP), STPA needed to indicate who would be consulted during the process of developing the EMP.

Health Canada also criticized the lack of monitoring information, particularly relating to air quality (subsequently rectified in part by

STPA’s submission of a draft air monitoring program), and spoke to the importance of monitoring VOC emissions during landfarming activities, and also carrying out medical checks for workers.

DFO indicated that they want STPA to monitor contaminants in Sydney Harbour on an ongoing basis. This recommendation was related to another recommendation, shared by DFO, Environment Canada and Natural Resources Canada, that STPA should carry out an ecological risk assessment to determine how contaminants originating from the Tar Ponds might affect ecological receptors. The risk assessment would be used to pinpoint the indicators for the subsequent monitoring program. DFO also wants STPA to monitor fish abundance and health in the portions of the Muggah Creek watershed that lie within the Project boundaries.

Various divisions within NSEL also spoke to the importance of monitoring, questioned the lack of information in the EIS and made recommendations on specific issues. Their questions included matters related to reporting monitoring results to the public, whether the Tar Ponds monolith would be monitored on an ongoing basis, and whether the length of the monitoring program would be tied to the lifespan of the remaining contaminants in-situ.

PWGSC spoke of the role of the Independent Engineer who would have oversight of the activities of STPA, reporting to both levels of government. One of the Independent Engineer’s responsibilities would be reporting on STPA’s environmental compliance record. Once the construction phase of the Project is complete, however, PWGSC stressed that the main responsibility for Project monitoring would rest with the Province.

From community representatives, the Panel heard six major concerns about monitoring:

- The absence of monitoring details in the EIS;
- The effectiveness and timeliness of air quality monitoring technology for both the incinerator and for remediation activities at the Tar Ponds and Coke Ovens sites, with respect to protecting residents' health and peace of mind;
- The extent to which cost would drive choices about monitoring technologies;
- STPA's willingness to share monitoring results with the public, including any exceedances, on a daily basis if necessary;
- The reliability of self-monitoring and the need for independent monitoring or at least oversight; and
- Questions about commitments made to implement ongoing monitoring after the twenty-five years.

The Panel heard from a number of presenters about their experiences with air quality monitoring at the Coke Ovens site during previous remediation activities. They complained that fixed stations located in or near residential areas only operated intermittently (STPA indicated that they were used on a six-day cycle because of costs) and that the laboratory took several days to return results. Handheld monitors, used more frequently by STPA, were not as sensitive and had failed to register air quality problems that occurred during the cleaning of the Domtar tank. There was also considerable discussion at the hearings about the relationship between detection thresholds of monitoring equipment and of the human nose.

Presenters also questioned the effectiveness of STPA's proposed incinerator emissions monitoring plan to detect the presence

of dioxins and furans. Residents wanted real-time, direct monitoring of the chemicals of concern rather than monitoring of operating function (oxygen, temperature etc). However, STPA and others disputed whether this was technically possible. Some people told the Panel that STPA should provide monitoring specifically designed to capture the effects of upset conditions; there should be effects monitoring of both human and ecological receptors looking for evidence of PCBs, dioxins, furans and metals; and also monitoring for corrosion effects in the community caused by hydrochloric acid emissions.

A health professional recommended monitoring of site workers for the accumulation of potentially carcinogenic metabolites.

Local residents made it clear that without the use of temporary enclosures under negative air pressure, they consider air quality monitoring to be their only protection from possible health effects caused by excavation and solidification activities.

Some presenters told the Panel that an independent body should carry out Project monitoring. STPA told the Panel that this was in fact the case; however it appeared that they were referring to the use of contracted experts.

8.4.3 Panel's Conclusions and Recommendations

The Panel agrees with many environmental assessment review participants, including STPA, that an effective monitoring program is an essential part of the Project. The details of this program are yet to be developed – as indeed are many details about the Project. The program would be required to carry out a number of key functions:

- Demonstrate to regulators and to the public that Project activities are being

carried out in compliance with all standards and approvals;

- Demonstrate to the public that activities are not causing effects that could endanger their health or well-being, either in the short-term or the long-term;
- Demonstrate to regulators and the public that predictions with respect to effects on ecological receptors are accurate;
- Provide feedback to STPA to determine when further mitigation measures must be applied;
- Provide ongoing information about the effectiveness of the containment system; and
- Indicate if and when remaining contaminants on the Tar Ponds and Coke Ovens sites no longer present a potential risk to human or ecological receptors.

The Panel therefore believes that an appropriate monitoring program, modelled on the draft air monitoring program submitted to the Panel and including mandatory action points, must be developed before the Project is allowed to proceed. The Panel believes that monitoring would be particularly important because (a) certain aspects of the proposed remediation approach for the Tar Ponds are not totally proven, and (b) contaminants would be remaining on site for a very long time if not in perpetuity.

The Panel recognizes that design of the monitoring program is crucial and that monitoring must be capable of delivering meaningful and timely information, using appropriate indicators, technologies and methodologies. Therefore the Panel believe that STPA should engage government and public experts and stakeholders in the design and review of the monitoring program

Recommendation # 52

Approval of Monitoring Program

The Panel recommends that approval for the Project be contingent on STPA preparing an adequate monitoring program that addresses all issues raised during the environmental assessment process and has been reviewed and approved by all key federal and provincial departments.

The Panel recognizes the importance of engaging independent, third party oversight of the monitoring program in order to build public confidence and to ensure outside input into the review of all monitoring results and any subsequent adaptive management decisions.

Recommendation # 53

Tar Ponds and Coke Ovens Remediation Monitoring Oversight Board

The Panel recommends that PWGSC and NSEL, before construction begins, appoint an independent three-member monitoring oversight board with a formal mandate tied in to the Federal-Provincial Regulatory Plan. The monitoring oversight board would act in a formal technical review capacity and to ensure the general public that the Project is proceeding within its approved guidelines. The board would meet as often as required and no less than twice a year, and would report to PWGSC and NSEL. All reports from the board would be made public. At the completion of the construction phase the role of the board would be re-evaluated and would thereafter be tied into the mandate of the *Tar Ponds and Coke Ovens Remediation Maintenance and Monitoring Act*. The Panel believes that public access to monitoring information is crucial. Wherever possible real time monitoring should be employed with the results posted on the web.

However, the Panel recognizes that sometimes real time monitoring may involve a trade-off with respect to accuracy or sensitivity. This information should also be provided to the public.

Recommendation # 54

Reporting Monitoring Results

The Panel recommends that STPA be required by PWGSC and NSEL to develop a Monitoring Results Reporting Protocol as part of the Monitoring Program, indicating what results would be reported, how, and when, and indicating the rationale for each decision. While web posting is likely to play a central role, the Protocol should identify other methods of communication required to provide access to information as widely as possible. NSEL should periodically audit STPA's compliance with its own Reporting Protocol.

8.5 ONGOING COMMUNITY CONSULTATION AND DISPUTE RESOLUTION

8.5.1 STPA Assessment

In the EIS, STPA provided information on past consultation efforts, before the establishment of STPA, and also on its own consultation and communications program to date which has included an extensive and frequently update website, a video, open houses, meetings with organizations, a quarterly newsletter, publication of monitoring information including exceedances, publication of Project reports, and a site interpretive program. STPA has formed a Community Liaison Committee with members appointed by STPA from specified neighbourhoods, sectors and types of organizations. The committee meets monthly and its minutes are posted on STPA website. STPA has also established a

Community Engagement Program that provides funding to local organizations and institutions to pursue educational or community development initiatives related to the Project.

STPA also provided the Panel with its *Dispute Resolution Policy* which tracks complaints, assigns them to an STPA employee who is charged with attempting to resolve the complaint in a timely fashion. If the dispute cannot be resolved the Chief Executive Officer makes the final decision with respect to any actions, and a written explanation is provided to the complainant.

STPA is committed to continue with these initiatives and is also adding a storefront office with access to the Project library and a dedicated staff person to assist the public.

8.5.2 Government and Community Concerns

The Panel heard extensively from the public on this issue. STPA received praise from some presenters for its open communication and willingness to respond to public requests. Even some stalwart critics of the Project design agreed that they appreciated being able to speak directly with executive officers of STPA. Representatives from the business community are evidently pleased with the relationship they have been able to forge with STPA.

On the other hand, the Panel heard considerable criticism of the Community Liaison Committee, particularly because certain stakeholders, who have been very actively engaged in the debate over the remediation plans over the years, have not been allowed to participate. STPA characterizes the CLC as a "sounding board" and a way for them to gauge reactions to STPA proposals. Others told the Panel that the CLC should be more representative of the community as a whole and more independent. Some presenters also told the

Panel that they had no communication with CLC members and therefore did not feel that their interests were being adequately represented.

8.5.3 Panel Conclusions and Recommendations

The Panel commends STPA for its communications initiatives and its commitment to provide Project information widely and in various formats, and to make available all technical documents. The Panel acknowledges earlier reports contained in the public registry discussing public opinion on community involvement in the Project. Specifically, a series of focus group interviews discussed in a report by Corporate Research Associates in 2004 found key themes to be public health and safety concerns, perceived lack of progress, and lack of trust particularly in governments as a source of information about the remediation. When queried about building trust, focus group participants suggested that this would be best achieved by real cleanup progress, as long as public health and safety continued to be paramount. There was a high level of interest in receiving Project information and focus groups suggested “sources of information concerning the Project should be from arm’s length, and not have a vested interest in the Project.” The Panel recognizes that the actual project was not defined during the time of this research and stakeholder views and concerns may have since evolved.

The Panel believes that constructive discussion during the hearings shows that an effective and credible community liaison group must represent the full range of community voices and affected interests.

The Panel concludes that the terms of reference for the Community Liaison Committee (CLC) must ensure that representatives are communicating effectively

with their constituencies as part of an overall outreach mandate. In turn, representatives must express views of their constituencies as part of a two-way information exchange within the CLC. The CLC should speak with an independent voice, even if the CLC’s views may sometimes differ from those of STPA. It is however entirely reasonable to require all members to participate in good faith in support of the Project being carried out as effectively and safely as possible, and to abide by basic ground rules fostering an environment of respect. The Panel is confident that this will be possible, given the courteous and constructive discussions that occurred during the public hearings.

The Panel also notes that a CLC may sometimes be able to represent community interests more effectively using grass roots approaches, rather than a proponent using standard, one-way communications programming. Such approaches can be effective in gaining insights into public information needs, clarifying misinformation and allowing the CLC to provide assistance to STPA in evaluating and improving its approach to interacting with the community.

Recommendation # 55

Community Liaison Committee

The Panel recommends that PWGSC and NSEL require STPA to maintain its Community Liaison Committee and to modify the Committee’s current terms of reference so that the appointment process is open and transparent, and that all key community interests are represented. The terms of reference should include a protocol to ensure that individual members will effectively relate to and report back to the people and organizations they represent, and should give the CLC a mandate to conduct its own community outreach activities during the Project. STPA should provide the CLC

with sufficient resources to conduct its business and to report back to the community. The CLC should use an open forum such as a community meeting or open house at least once a year, and should also meet at least bi-annually with the Monitoring Oversight Board.

9 CONCLUSIONS AND RECOMMENDATIONS

The Panel concludes that the Project and the technically and economically feasible means of carrying out the Project are unlikely to result in significant adverse environmental effects provided that the recommendations of the Panel are followed and implemented.

1. *Recommendation to NSEL:* The Panel recommends that the Nova Scotia Minister of Environment and Labour approve the undertaking subject to conditions which address the recommendations in this report.
2. *STPA Mitigation Measures:* The Panel recommends that the Government of Canada and the Government of Nova Scotia ensure that mitigation measures proposed by the Sydney Tar Ponds Agency as an integral part of the Project are implemented.
3. *Toxic Substances Management Policy:* The Panel recommends that Environment Canada, with the assistance of Health Canada, provide advice to PWGSC to ensure the Project is in full compliance with the *Toxic Substances Management Policy*. The federal departments should ensure that an analysis of risks, costs and benefits is completed of the North Pond PCB removal alternative. That analysis should give appropriate consideration to social issues. The results of the analysis should determine if the PCBs in the North Pond hot spot are to be removed or if minimizing PCB exposure and the site's potential risks are to be addressed by way of the *Full Containment, No Incineration* project alternative. The Panel recommends that PWGSC and NSEL require STPA to conduct the same analysis of South Pond PCBs.
4. *Combined Emissions and Expected Ambient Air Concentrations:* The Panel recommends that NSEL and PWGSC require STPA to calculate the total expected ambient air concentrations due to the combination of all Project-related emission sources and the existing pollutant levels in the local air shed. The results of this analysis may affect the ecological and human health risk assessments. NSEL and PWGSC should require STPA to re-evaluate the risk assessments and incorporate the results into the Project design and applications for regulatory approvals, as appropriate.
5. *The Solidification / Stabilization Process and Air Emissions:* The Panel recommends that NSEL and PWGSC require STPA, as part of a pilot in-situ study of the solidification / stabilization process (Recommendation 13), evaluate the potential for air-borne emissions and implement appropriate mitigation measures and integrate these measures within the Project design.
6. *Remediation and the Air Monitoring and Follow-Up Program:* The Panel recommends that NSEL and PWGSC require STPA (with the appropriate involvement of Environment Canada, Health Canada, the Medical Officer of Health, the Cape Breton District Health Authority, and the Project Community Liaison Committee) to design an Air Monitoring and Follow-up Program for the Project. The program should be based on technically sound principles and procedures with special consideration given to:

- Incorporating the results of the proposed evaluation of the existing monitoring network, including an evaluation of the causes of and responses to recent air quality incidents at the Tar Ponds and Coke Ovens sites;
- Development of conservative, unambiguous and practical air quality monitoring criteria;
- Appropriate responses to exceedances of air quality monitoring criteria;
- The need for real-time data, early warning and early reporting of deteriorating air quality;
- The need for a public communication plan providing results and, if required, an indication of effects on public health;
- Monitoring of the PM2.5 and PM10 fractions of particulates;
- PCB monitoring near Tar Ponds excavations;
- Reporting real-time air quality exceedances at the perimeter of the sites or off-site to the Medical Officer of Health; and
- Periodically reporting back to the NSEL and PWGSC on the accuracy of the air quality predictions and the effectiveness of any measures taken to mitigate adverse air quality effects.

7. *Groundwater and Surface Water Protection Design Requirements:* The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- Incorporate hydrogeological modelling results into the final design of the groundwater and

surface water control measures and the monitoring network;

- Provide detailed calculations of the volume of groundwater that could flow through the Coke Ovens site following surface water diversion and the installation of the underground barriers and the surface cap;
- Assess potential hydrostatic mounding that may be generated when groundwater flow encounters cut-off walls and address the impact of mounding, if required.; and
- Define and model the flow pattern of both ground water intrusion from the Coke Oven site and infiltration of sea water from the harbour to identify the amount of water that could collect under the monolith, including seasonal changes.

8. *Groundwater Monitoring Program:* The Panel recommends that, prior to providing funds or issuing approvals to proceed with the Project, NSEL and PWGSC require STPA to develop a detailed groundwater monitoring program for the various Project areas, including the intermediate and deeper bedrock zones. The program should demonstrate:

- How the distribution and location of the water sampling wells would (a) detect the amount of water that would penetrate to the contaminated material through the cap and as a result of the modified groundwater flow regime, and (b) identify potential underground flows of contamination from the Coke Ovens site; and
- How the flow of leachate from the municipal landfill site would be monitored and mitigated.

9. Cap Design: The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- Develop scientific and engineering criteria to design the Tar Ponds cap, including thickness and hydraulic conductivity criteria for the various layers; and
- Describe how the final design and implementation of both Tar Ponds and Coke Ovens site caps would respond potential problems such as exposure to repeated freeze / thaw cycles, non-aqueous phase layer (NAPL) migration, generation and migration of gas under the capping layer, erosion, and fissures.

10. Cap Monitoring Program: The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to develop a cap monitoring program with an aim to:

- Ensure that the physical integrity of the caps at the Tar Ponds and Coke Ovens sites can be effectively managed;
- Assess the integrity of the monolith structure within saline conditions; and
- Assess the permeability of the monolith cap under freeze / thaw conditions.

11. Solidification / Stabilization Criteria: The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- Develop criteria for the solidification / stabilization process to be used for treating the North Tar Pond sediment, South Tar Pond sediment, incinerator bottom ash, Tar Cell materials and Coke Ovens Brook sediments;
- As part of criteria development establish site-specific leachate criteria for PAHs and PCBs and data quality objectives to demonstrate that remedial activities would not significantly increase contaminant mobility; and
- Provide the results of the above to Environment Canada and NSEL for review and comment.

12. Treatability Study: The Panel recommends that, prior to providing funds or issuing approvals to proceed with solidification / stabilization, NSEL and PWGSC require STPA to:

- Assess the heterogeneity of Tar Ponds sediments and Tar Cell materials for characteristics relevant to solidification / stabilization;
- Use the results of the above to conduct a laboratory solidification / stabilization treatability study on the South Tar Ponds sediment;
- Based on the laboratory results develop interim specifications on the solidification / stabilization treatment formula (additives and dosage rates) to be used for the North and South Tar Ponds and Tar Cell; and
- Provide the results of the above to Environment Canada and NSEL for review and comment.

13. Pilot Scale Study: The Panel recommends that, prior to providing funds or issuing approvals to proceed

with solidification / stabilization, NSEL and PWGSC require STPA to:

- Conduct a pilot in-situ study on both ponds including site specific evaluations of the proposed solidification / stabilization process;
- The evaluation should include use of the treatment formula specifications developed above and use of at least one type of construction technique proposed for full-scale application; and
- Conduct a sampling and testing program of the S / S products over time where samples of the in place product are collected and tested to determine compliance with the pre-established criteria; and
- Provide the results of the above to Environment Canada and NSEL for review and comment.

14. Wastewater Treatment: The Panel recommends that NSEL require STPA, when submitting information in support of approvals to discharge wastewaters, to:

- Provide details of the wastewater treatment methods to be employed;
- Identify the contaminants to be treated and their related numerical discharge criteria; and
- Provide information on how compliance with the requirements under Section 36 of the *Fisheries Act* would be demonstrated.

15. Fish Migration: The Panel recommends that NSEL and PWGSC require STPA to consult with DFO in the design of the Project's constructed watercourses and in the design of a long-term aquatic biodiversity monitoring study of the Coke Ovens Brook and Wash Brook watersheds.

16. Landfarming: The Panel recommends that, prior to providing funds or issuing approvals, STPA reevaluate the need to undertake landfarming at the Coke Ovens site and provide the rationale for the decision to the Project's funding partners for approval.

17. Water Quality Monitoring: The Panel recommends that PWGSC and NSEL require STPA to:

- Monitor the quality and discharge rate of both the ground water and the surface water to the marine environment during the entire construction phase of the and the Tar Ponds and Coke Ovens site remediation project; and
- Establish a permanent water quality monitoring program at the discharge of the channel to Sydney Harbour.

18. Ecological Risk Assessment: The Panel recommends that PWGSC require STPA to undertake a quantitative assessment of the risk of remedial activities to marine receptors within the South Arm of Sydney Harbour. The risk assessment should incorporate changes in the flux of contaminants from the Tar Ponds during and following completion of the Project.

19. Long-Term Monitoring of Sydney Harbour: The Panel recommends that PWGSC, in consultation with NRCan, DFO, Environment Canada, and STPA, design a long-term monitoring program to document improvements in the environmental quality of Sydney Harbour. DFO should assume the lead for long-term monitoring.

20. Air Dispersion Modelling & Risk Assessment: The Panel recommends that

NSEL and PWGSC require STPA to conduct additional dispersion and risk assessment modeling once the number of incinerators and details of the incinerator design are finalized to confirm the predictions presented in the EIS. This analysis should be provided to Environment Canada, Health Canada, and NSEL for review and comment.

21. *Pollution Control and Monitoring*

Technology: The Panel recommends that:

- EC and NSEL develop criteria for PCBs, dioxins and furans, and hexachlorobenzene in incinerator emissions incorporating the principle of best available techniques as it is defined by the Stockholm Convention;
- NSEL use the developed criteria in the drafting of regulatory approvals for incineration; and
- NSEL require STPA to identify and use best available technologies and best environmental practices when monitoring air emissions of PCBs, dioxins and furans, and hexachlorobenzene from the incinerator.

22. *Enclosure of Incinerator Facilities:*

The Panel recommends that STPA be required by NSEL and PWGSC to enclose the incinerator and all ancillary storage areas for feedstock, bottom ash and fly ash in order to capture and monitor any fugitive emissions and to prevent adverse weather effects.

23. *Effects on Wells at the VJ Site:* The Panel recommends that NSEL and PWGSC require STPA to monitor the affect of Project water usage at the VJ site on the underlying aquifer and on

private wells drawing from the aquifer, and to develop an appropriate mitigation plan should adverse effects be identified.

24. *Monitoring of Surface Water Resources:*

The Panel recommends that NSEL and PWGSC require STPA to monitor the environmental effects of incinerator operations on surface water bodies and aquatic resources. Monitoring techniques should employ best environmental practices and results reported to the public and to the operators of local water supply systems.

25. *Phalen Site Water Supply:*

Should an incinerator be sited at Phalen, the Panel recommends that NSEL and PWGSC require STPA to consult with CBRM and confirm that the municipality will be able to supply the required volume of water.

26. *Incinerator Bidders' Track Record:*

The Panel recommends that, when requesting proposals for incineration services, STPA require bidders to provide full disclosure of their track record in constructing and operating comparable facilities including their record of regulatory compliance, and this information be (a) placed on the public record, and (b) be given significant weighting in the bidder evaluation process.

27. *Bond Requirements:*

The Panel recommends that STPA require the successful incineration bidder to post a bond sufficient to cover the costs of completing the safe destruction, disposal or management of the contaminated materials intended for incineration, in the event that, for reasons of equipment malfunction, accidents, or failure to comply with regulatory requirements,

the bidder is unable to deliver the contracted services in a safe and timely manner.

- 28. *Increasing Regulatory Capacity:*** The Panel recommends that NSEL review existing staff capacity in relation to the skill set and experience required to oversee an effective permitting and enforcement program for hazardous waste incineration, identify gaps and fill those gaps through appropriate training or staff acquisition.
- 29. *Thermal Relief Valve:*** The Panel recommends that STPA be required by NSEL and PWGSC to install appropriate pollution control mechanisms on the thermal relief valve if it is technically possible to do so, and to investigate and incorporate ways to monitor emissions from the valve. STPA should also be required to develop appropriate protocols to deal with malfunctions.
- 30. *Monitoring Upset Conditions:*** The Panel recommends that STPA be required by NSEL and PWGSC to monitor upset conditions at the incinerator and report them immediately to regulatory authorities, including the Medical Officer of Health. An appropriate response plan should also be put in place.
- 31. *Monitoring Environmental Effects of Incineration:*** To validate the conclusions of the modeling and risk assessments the Panel recommends that NSEL and PWGSC require STPA to include the following in its monitoring and follow-up program:

- Establishing baseline conditions;

- Monitor contaminant levels in country foods such as fish and berries, and in garden produce; and
- Monitor effects of air emissions on sensitive lichen species.

32. *Community Involvement:* The Panel recommends that STPA, in collaboration with the Community Liaison Committee (see Recommendation 55) be required by NSEL and PWGSC to develop a community consultation program to engage with residents in the vicinity of the incinerator site to provide information, identify and address concerns, and establish an ongoing reporting protocol.

33. *Economic Benefits Strategy:* The Panel recommends that STPA be required by NSEL and PWGSC to develop a comprehensive economic benefits strategy to ensure that economic benefits and employment accrue locally to the greatest extent possible. The strategy should include a monitoring and reporting program to track local business and labour participation in the Project. The strategy should also address ways in which the Project can help to develop local business capacity and labour market skills in order to have lasting effects after completion of the remediation.

34. *Women's Employment Strategy:* The Panel recommends that STPA carry out a gender analysis as part of their forthcoming labour capacity study, and work with local women's organizations, business organizations and education and training institutions to develop a women's employment strategy to promote and facilitate the participation of women in the non-traditional trades

and technologies required by the Project. STPA should also monitor the participation of women throughout the life of the Project. This strategy and associated monitoring program should be integrated into the overall Economic Benefits Strategy and its reporting requirements.

- 35. *African Nova Scotian Employment Strategy:*** The Panel recommends that STPA, in consultation with the Cape Breton Black Employment Partnership Committee, develop equity policies and training and outreach programs to promote and facilitate the training and employment of African Nova Scotians on the remediation Project, and should monitor the results throughout the life of the Project. This strategy and associated monitoring program should be integrated into the overall Economic Benefits Strategy and its reporting requirements.
- 36. *Transportation Management Plan:*** The Panel recommends that STPA be required by NSEL and PWGSC to develop a Transportation Management Plan before Project construction begins. STPA should consult with NSTPW and CBRM in preparing the Plan, which should address infrastructure impacts, transportation routes, timing, dust management, safety issues, contractor compliance, communications, monitoring and reporting. The Plan should include an easily accessible complaints mechanism and proposed mitigation alternatives. STPA should review the Plan with the Community Liaison Committee on a regular basis (no less than once a year).
- 37. *Ensuring Rail Safety:*** The Panel recommends that STPA be required by NSEL and PWGSC to file a Rail Safety

report with NSTPW before Project approval is given. The report should document:

- The current capacity of the rail infrastructure between the Tar Ponds and incinerator sites to safely transport materials;
- Any improvements required; and
- A spill contingency plan as an integral part of the Project's Environmental Management Plan.

- 38. *Use of Rail to Transport Construction Materials:*** The Panel recommends that wherever possible, STPA identify and employ additional opportunities to transport construction materials by rail to the Project sites to reduce transportation impacts.
- 39. *Future Use Plan:*** The Panel recommends that STPA, in collaboration with CBRM, develop a future use plan for the remediated Tar Ponds and Coke Ovens site that addresses the requirements of the evolving Port to Port Corridor concept, the community's interest in active living open space opportunities, the issues and concerns of adjacent neighbourhoods, the practical realities of the remediation process and subsequent monitoring and maintenance. The plan should draw on examples of best practice in brown field redevelopment wherever possible, and identify the resources necessary for implementation.
- 40. *Minimizing Restrictions on Future Uses Through Site Design Enhancements:*** The Panel recommends that STPA, in collaboration with CBRM and other stakeholders review the Project design with respect to maximizing the capacity of the two sites to support a variety of

future uses, as identified through the future use planning process addressed in Recommendation 39. The Panel further recommends that STPA incorporate all feasible site enhancements, such as bearing capacity and cap design improvements, and conduits for future site services, which fall within the designated funding.

- 41. *Maximizing Aquatic Habitat Restoration as Part of Future Use Planning:*** The Panel recommends that STPA, in consultation with NSEL, NSDNR, DFO and EC, develop a detailed habitat restoration plan for the Tar Ponds area, drawing the disciplines of remediation engineering and landscape architecture. The goal of the restoration plan is to increase the area of reclaimed estuarine habitat, while still enabling the effective encapsulation of contaminated sediments.
- 42. *Tree Planting:*** The Panel recommends that STPA, in consultation with CBRM and other community stakeholders develop a native tree planting plan for both sites, together with a strategy for early implementation. The species of trees and shrubs selected should be compatible with the type of managed terrestrial ecosystem required to ensure the integrity of the caps. The Panel also recommends that STPA consider creating a native tree species nursery on site to provide the necessary planting stock which may otherwise be difficult to obtain.
- 43. *Maintenance of Community Open Space:*** The Panel recommends that, in the event that STPA and CBRM do not identify viable alternative commercial or institutional uses for the remediated lands site that are acceptable to the

community, STPA be required by NSEL and PWGSC to set aside a portion of the annual monitoring and maintenance budget to contribute funds over a 25-year period to cost-share the operation and maintenance of a trail and open space system on the remediated lands. This set aside would be part of STPA's responsibility to ensure the continued integrity and function of the encapsulation and drainage systems. If alternative land uses are pursued, the Panel recommends that sufficient land be set aside to provide an active transportation link between Whitney Pier and downtown Sydney, and that STPA ensure that remediation design (bearing capacity, cap design, soil cover etc) minimizes the cost of developing the facility.

- 44. *Perimeter Enhancement Strategy:*** The Panel recommends that STPA's final Project design be required by NSEL and PWGSC to include a perimeter enhancement strategy to mitigate any interactions between the Project and local residents at the perimeter of the site and to add value to adjacent residential areas through added amenity at the interface area (landscaping, community facilities etc.). In the process of developing the strategy, STPA should consult with residents of the adjacent neighbourhoods through the Community Liaison Committee.
- 45. *Property Value Protection Program:*** The Panel recommends that STPA, in consultation with CBRM, be required by NSEL and PWGSC to develop a property value protection program to be applied to properties in the immediate vicinity of the remediation sites and at most risk of being affected by noise, odour, dust or transportation.

46. Contingency Planning for Heritage

Resources: The Panel recommends that when STPA develops the contingency plan related to archaeology and heritage resources to be included in the Environmental Management Plan, this information should be shared with parties with an interest or a potential role to play upon discovery of items of significance. These include First Nations representatives, government, academic and community interests.

47. Federal-Provincial Regulatory Plan for the Tar Ponds and Coke Ovens Project:

The Panel recommends that before the Project construction begins, the federal and provincial governments prepare a coordinated regulatory plan for the Project and commit to it by signing a Memorandum of Agreement. The regulatory plan should address the following issues:

- A formal collaborative process between the federal and provincial governments to (a) share expertise and (b) coordinate relevant regulatory processes;
- How the regulation of construction phase activities on both the federal and provincial portions of the sites would be coordinated;
- Regulations, guidelines, standards and criteria to be applied to activities, emissions and discharges;
- Compliance and effects monitoring;
- Proponent reporting requirements;
- Inspection and auditing procedures;
- Staff and other resources;
- Enforcement responsibilities and procedures;
- Process required to amend the regulatory plan;

- The requirement for an annual Regulators Report to the public; and
- Opportunities for public review and feedback.

48. Federal Expert Advice: The Panel recommends that PWGSC seek assistance from Environment Canada, Health Canada, Fisheries and Oceans Canada, and Natural Resources Canada to ensure that mitigation measures and a follow-up program are implemented.

49. Tying Funding to Technology Testing: The Panel recommends that the Project's funding partners implement a performance-based funding process that would see the dispersal of funds being tied to the:

- Successful testing of solidification / stabilization (Recommendations 12 and 13);
- Successful testing and operation of the incinerator; and
- Successful implementation of mitigation measures.

50. Tar Ponds and Coke Ovens Remediation Maintenance and Monitoring Act: The Panel recommends that, before the completion of the construction phase at the Tar Ponds and Coke Ovens sites, the Government of Nova Scotia enact legislation to address the long-term management, maintenance, monitoring and reporting required to ensure that the containment and water control and treatment systems on the remediated sites are maintained and monitored for as long as the contaminants remaining on site present a potential risk to people or the environment. The Act should include provisions for reporting and accountability. The Act should specify

under what conditions maintenance and monitoring can cease.

- 51. *Provincial and Federal Ownership of Remediated Lands:*** The Panel recommends that the capped portions of both the remediated Tar Ponds and Coke Ovens site remain in provincial or federal ownership until such time as the integrity of the cap is no longer a requirement as defined in Recommendation 10.
- 52. *Approval of Monitoring Program:*** The Panel recommends that approval for the Project be contingent on STPA preparing an adequate monitoring program that addresses all issues raised during the environmental assessment process and has been reviewed and approved by all key federal and provincial departments.
- 53. *Tar Ponds and Coke Ovens Remediation Monitoring Oversight Board:*** The Panel recommends that PWGSC and NSEL, before construction begins, appoint an independent three-member monitoring oversight board with a formal mandate tied in to the Federal-Provincial Regulatory Plan. The monitoring oversight board would act in a formal technical review capacity and to ensure the general public that the Project is proceeding within its approved guidelines. The board would meet as often as required and no less than twice a year, and would report to PWGSC and NSEL. All reports from the board would be made public. At the completion of the construction phase the role of the board would be re-evaluated and would thereafter be tied into the mandate of the

Tar Ponds and Coke Ovens Remediation Maintenance and Monitoring Act.

- 54. *Reporting Monitoring Results:*** The Panel recommends that STPA be required by PWGSC and NSEL to develop a Monitoring Results Reporting Protocol as part of the Monitoring Program, indicating what results would be reported, how, and when, and indicating the rationale for each decision. While web posting is likely to play a central role, the Protocol should identify other methods of communication required to provide access to information as widely as possible. NSEL should periodically audit STPA's compliance with its own Reporting Protocol.
- 55. *Community Liaison Committee:*** The Panel recommends that PWGSC and NSEL require STPA to maintain its Community Liaison Committee and to modify the Committee's current terms of reference so that the appointment process is open and transparent, and that all key community interests are represented. The terms of reference should include a protocol to ensure that individual members will effectively relate to and report back to the people and organizations they represent, and should give the CLC a mandate to conduct its own community outreach activities during the Project. STPA should provide the CLC with sufficient resources to conduct its business and to report back to the community. The CLC should use an open forum such as a community meeting or open house at least once a year, and should also meet at least bi-annually with the Monitoring Oversight Board.

APPENDIX A PANEL MEMBERS

MS. LESLEY GRIFFITHS, (CHAIR)

Ms. Griffiths is Co-principal of Griffiths Muecke, a community planning and environmental consulting firm. She chaired the federal-provincial review Panel for the environmental assessment of the Voisey's Bay Mine and Mill Project in northern Labrador, and was also a review Panel member for the environmental assessment of the original Halifax Harbour Cleanup Project. In 2003, Ms. Griffiths was appointed Chair of an environmental assessment Panel to review the Trans-Labrador Highway Phase III Project. She co-chaired the Nova Scotia Minister of Environment and Labour's Task Force on Clean Air in 1992, producing the Province's first air quality management strategy.

Since 1996 she has worked with the Five Island Lake Community Liaison Committee for the Nova Scotia Department of Transportation and Public Works, addressing the remediation of a contaminated site. She is also a member of the Board of Directors, Clean Nova Scotia.

Ms. Griffiths brings significant community planning expertise and Chair experience on similar environmental assessment Panels within Atlantic Canada.

MR. WILLIAM H.R. CHARLES

Mr. Charles has had a long and distinguished career as a lawyer, professor and Chair of advisory boards within Nova Scotia. He is a Queen's Counsel, former Dean of the Dalhousie University Law School, former Chair of the Nova Scotia Environmental Assessment Board, former President of the Nova Scotia Environmental Control Council and former President of the Law Reform Commission of Nova Scotia.

Mr. Charles chaired the Nova Scotia environmental assessment Panel that conducted public hearings for the Burnside Waste to Energy Incinerator proposal by Ogden Martin in 1993-94. He was also a member of the Nova Scotia environmental assessment Panel that conducted public hearings for the Stellarton Open Mine in 1995.

Mr. Charles brings significant legal, administrative tribunal and environmental assessment Panel experience to the Panel.

DR. LOUIS LAPIERRE

Dr. LaPierre is a native Nova Scotian from Chezzetcook who has spent most of his working career in Atlantic Canada. He currently holds the K.C. Irving Chair in Sustainable Development at the Université de Moncton (since 1993). He was Chairman of the Environmental Council of New Brunswick between 1981 and 1990 and, in 1989, was named Chairman of the Sustainable Development Task Force for the Premier's Round Table on Environment and Economy. Since 1997, Dr. LaPierre has co-chaired the Round Table with the New Brunswick Minister of Economic Development.

He also served on the federal environmental assessment Panel that reviewed the high level nuclear waste program from 1995-2000. In 1997, he was invited by the Minister of Natural Resources

and Energy to develop an integrated strategy for the protection of natural areas in New Brunswick. He was Chairman of the Fundy Model Forest and was a member of the Steering Committee of the Nova Forest Alliance of Nova Scotia.

In 1996, Dr. LaPierre was appointed by the federal government as Chair of the Institute for Environmental Monitoring and Research associated with the low-level flying program in Labrador and north-eastern Québec. He is also a member of the scientific team reviewing PEI's fixed link impact on the environment.

Dr. LaPierre brings significant scientific and previous Panel experience to the Panel.

APPENDIX B JOINT PANEL AGREEMENT

Agreement Concerning the Establishment of a Joint Review Process for the Sydney Tar Ponds and Coke Ovens Sites Remediation Project

Between

*Her Majesty the Queen in Right of Canada as represented by the
Minister of the Environment, Canada*

- and -

*Her Majesty the Queen in Right of Nova Scotia as represented by the Minister of Environment and
Labour, Nova Scotia (“NSEL”)*

Preamble

WHEREAS the Minister of the Environment, Canada, has statutory responsibilities pursuant to the *Canadian Environmental Assessment Act*;

WHEREAS the Minister of Environment and Labour, Nova Scotia, has statutory responsibilities pursuant to the *Nova Scotia Environment Act* and has determined the Sydney Tar Ponds and Coke Ovens Sites Remediation to be an undertaking pursuant to subsection 3(2) of the *Environmental Assessment Regulations*;

WHEREAS the Minister of Public Works and Government Services, Canada, and the Premier of Nova Scotia signed a Memorandum of Agreement (MOA) on May 12, 2004, for the Remediation of the Sydney Tar Ponds and Coke Ovens Sites in the Cape Breton Regional Municipality;

WHEREAS portions of the Sydney Tar Ponds and Coke Ovens Sites are federally and provincially owned and the remediation of the Sites is jointly funded;

WHEREAS the Sydney Tar Ponds Agency (the Proponent) is designated pursuant to the MOA for the management and implementation of the Project;

WHEREAS the Sydney Tar Ponds Agency plans to remediate and rehabilitate the Tar Ponds and Coke Ovens Sites, in accordance with the MOA, which is subject to an environmental assessment under both the *Canadian Environmental Assessment Act* and the *Nova Scotia Environment Act*;

WHEREAS the MOA commits Canada and Nova Scotia to a joint environmental assessment;

WHEREAS the Project was referred to a review panel in accordance with section 29 of the *Canadian Environmental Assessment Act*;

WHEREAS the Minister of Environment and Labour, Nova Scotia, may, pursuant to section 47 of the *Nova Scotia Environment Act*, enter into an agreement with another government agency to conduct a joint environmental assessment review and to adopt for the purposes of the review all or part of that government agency's procedures for environmental assessment;

WHEREAS the Minister of Environment and Labour, Nova Scotia, may, pursuant to section 48 of the Nova Scotia *Environment Act*, enter into an agreement with another government agency to provide for a single hearing process;

WHEREAS the Minister of Environment and Labour, Nova Scotia, and the Minister of the Environment, Canada, have determined that a joint panel review of the Project will ensure that the project is evaluated according to the spirit and requirements of their respective legislation while avoiding unnecessary duplication, delays and confusion that could arise from separate environmental assessments;

WHEREAS the Minister of the Environment, Canada, has determined that a joint review panel should be established pursuant to subsection 40(2) of the *Canadian Environmental Assessment Act*;

THEREFORE, the Minister of Environment and Labour, Nova Scotia, and the Minister of the Environment, Canada, hereby establish a joint review panel for the Project in accordance with the provisions of this Agreement and the Terms of Reference attached hereto as an Appendix.

1. Definitions

For the purpose of this Agreement and of the Appendix attached hereto,

"Agency"

means the Canadian Environmental Assessment Agency.

"Day"

means calendar day.

"Environmental Effect"

means, in respect of the Project,

- a) any change, whether positive or negative, that the Project may cause in the Environment, including any change it may cause to a listed wildlife species, its critical habitat or the residence of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act* and,
- b) any effect on socio-economic conditions, environmental health, physical and cultural heritage, the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing including those of historical, archaeological, paleontological or architectural significance and,
- c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.

"Environmental Impact Statement"

means the document that the proponent has prepared in accordance with the Environmental Impact Statement Guidelines to be prepared by the parties.

"Federal Authority"

refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

"Follow-up Program"

means a program for verifying the accuracy of the environmental assessment of the Project, and determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

"Joint Review Panel"

means the review panel established jointly by the Minister of Environment and Labour, Nova Scotia, and the Minister of the Environment, Canada, pursuant to this Agreement.

"Memorandum of Agreement"

means the agreement signed by the Premier of Nova Scotia and the Minister of Public Works and Government Services, Canada, on May 12, 2004 for the remediation of the Sydney Tar Ponds and Coke Ovens Sites in the Cape Breton Regional Municipality.

"Mitigation"

means, in respect of the Project, the elimination, reduction or control of the adverse environmental effects of the Project, and may include restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.

"NSEL"

means Nova Scotia Environment and Labour.

"Parties"

means the signatories to this Agreement.

"Project"

means the Sydney Tar Ponds and Coke Ovens Sites Remediation Project, located in Sydney, Nova Scotia, as described in the *Project Description* document submitted by the Sydney Tar Ponds Agency and summarized in Part I of the Appendix attached hereto.

"Report"

means the document produced by the Joint Review Panel which shall contain the recommendations of the Joint Review Panel pursuant to the Nova Scotia *Environment Act* and the Joint Review Panel's rationale, conclusions and recommendations, including any mitigation measures and follow-up program, pursuant to the *Canadian Environmental Assessment Act* with respect to the environmental assessment of the Project.

"Responsible Authority"

refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

2. Establishment of the Joint Review Panel

2.1. A process is hereby established for the creation of a joint review panel, pursuant to sections 40, 41 and 42 of the *Canadian Environmental Assessment Act*, and sections 47 and 48 of the Nova Scotia *Environment Act*.

2.2. The Agency and NSEL will make arrangements for the coordination of announcements respecting the joint review of the Project, including review process initiatives that precede the establishment of the Joint Review Panel.

3. Constitution of the Joint Review Panel

3.1. The Joint Review Panel shall consist of three members, one of whom shall be the chair.

3.2. The Joint Review Panel members including the chair will be appointed by the Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia, from a list of nominees selected by the Parties. Following interviews to be conducted jointly by the Agency and NSEL, each of the Parties will select three nominees and at least one nominee selected by each of the Parties will be appointed members of the Panel. The parties will agree on the appointment of a chairperson. The members of the Joint Review Panel will be appointed following release of the final EIS Guidelines.

3.3. The Joint Review Panel members shall be unbiased and free from any conflict of interest relative to the Project and are to have knowledge or experience relevant to the anticipated environmental effects of the Project.

4. Conduct of Assessment by the Joint Review Panel

4.1. The Joint Review Panel shall conduct its review in a manner that discharges the requirements set out in the *Canadian Environmental Assessment Act*, Part IV of the Nova Scotia *Environment Act* and in the Terms of Reference attached hereto as an Appendix.

4.2. All Joint Review Panel hearings shall be public and shall provide for public participation.

4.3. The Joint Review Panel shall have all the powers and duties of a panel set out in section 35 of the *Canadian Environmental Assessment Act*.

5. Secretariat and Administrative Matters

5.1. Administrative, technical, and procedural support for the Joint Review Panel shall be provided by a Secretariat. The Secretariat shall be the joint responsibility of the Agency and NSEL.

5.2. The Secretariat shall report to the Joint Review Panel and shall be structured so as to allow the Joint Review Panel to conduct its review in an efficient and cost-effective manner.

5.3. Prior to the appointment of the Joint Review Panel, the Agency and NSEL shall prepare a budget estimate for the joint review.

5.4. Costs associated with the review will be apportioned between the parties 70% federally funded and 30% provincially funded. A detailed cost-sharing agreement is to be finalized by the Agency and NSEL prior to the appointment of the Joint Review Panel.

6. Record of Joint Review and Report

6.1. A public registry consisting of all submissions, correspondence, hearing transcripts, exhibits and other information received by the Joint Review Panel and all public information produced by the Joint Review Panel relating to the environmental assessment of the Project shall be maintained by the Secretariat during the course of the review in a manner that provides for convenient public access, and for the purposes of compliance with section 55 of the *Canadian Environmental Assessment Act* and the practices of NSEL.

6.2. On completion of the review of the Project, the Joint Review Panel shall prepare a Report for submission to the Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia.

6.3. The Report shall include recommendations on all factors set out in section 16 of the *Canadian Environmental Assessment Act* and, section 12 of the Nova Scotia Environmental Assessment Regulations. The report shall also include a recommendation pursuant to Part IV of the *Nova Scotia Environment Act*.

6.4. Once completed, the Joint Review Panel will submit the Report, to the Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia, and the Parties will then make the Report public.

6.5. Once the Report is submitted to the Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia, the responsibility for the maintenance of the public registry, pursuant to the *Canadian Environmental Assessment Act*, will be transferred to the Responsible Authorities.

6.6. All Responsible Authorities shall take into consideration the Report submitted by the Panel and, with the approval of the Governor in Council, respond to the Report. Then, the Responsible Authorities shall take one of the courses of action provided for in subsection 37(1) of the *Canadian Environmental Assessment Act* that is in conformity with the approval of the Governor in Council.

6.7. The Minister of Environment and Labour, Nova Scotia, shall consider the recommendation of the Panel, and either approve with conditions, or reject the Project.

6.8. The Parties will consult and coordinate on the nature and timing of their respective decisions on the project.

7. Other Government Departments

7.1. At the request of the Joint Review Panel, Federal Authorities and provincial government agencies having specialist knowledge with respect to the Project shall provide available information and knowledge in a manner acceptable to the Joint Review Panel.

7.2. Subject to article 7.1 and subsection 12(3) of the *Canadian Environmental Assessment Act*, nothing in this agreement shall restrict participation by way of submission to the Joint Review Panel by other federal or provincial government departments or bodies.

8. Participant Funding

8.1. Participant funding for the joint review will be provided and administered by the Agency pursuant to the federal Participant Funding Program.

9. Amending this Agreement

9.1. The Parties may amend this Agreement by written memorandum executed by both the Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia. Subject to section 27 of the *Canadian Environmental Assessment Act*, this agreement may, with 30-day written notice, be terminated by either party at any time during the joint review.

In witness whereof the Parties hereto have put their signatures this 13 day of July 2005.

Original signed by: _____

Minister of the Environment
Canada

Original signed by: _____

Minister of Environment and Labour
Nova Scotia

Appendix

Terms of Reference for the Joint Review Process

Part I - Project Description

Pursuant to the Memorandum of Agreement, the Sydney Tar ponds Agency (the proponent) is proposing to remediate the Sydney Tar Ponds and Coke Ovens Sites in the Regional Municipality of Cape Breton (CBRM), Nova Scotia.

The proposed remediation project would involve the removal of selected polychlorinated biphenyl (PCB) and polycyclic aromatic hydrocarbon (PAH) contaminated sediments from the Tar Ponds and Coke Ovens Sites, and destroy it in a temporary incinerator that will be located within the CBRM. Sediments that remain in the Tar Ponds would be solidified and stabilized in-place. Water course diversion channels would redirect surface water flowing through the Tar Ponds site. A containment system of barrier walls and an engineered cap would be constructed to reduce exposure and to prevent the movement of contaminants away from the Tar Ponds site. The Tar Ponds site surface would be restored and landscaped in a manner compatible with the natural surroundings of the area and future site uses.

At the Coke Ovens site, selected remaining contaminated soils would be treated in-place using landfarming, a form of bioremediation. Diversion channels and barrier walls would reroute groundwater and surface water flowing through the Coke Ovens site. A containment system of barrier walls and soil cover would be constructed to reduce exposure to contaminants and to prevent the movement of contaminants from the Coke Ovens site. Coke Ovens site surfaces would be restored and landscaped in a manner compatible with the natural surroundings and future sites uses.

Pre-cleanup activities would include construction of parking lots, equipment and supply storage areas, security facilities, offices and washrooms, decontamination facilities for personnel, equipment decontamination pads, and isolation pads. A dedicated use water treatment facility may be required. A temporary incinerator and associated facilities would be commissioned, requiring an area of approximately 2 to 5 hectares. The proponent plans completion of clean-up and capping of the Coke Ovens site by 2011, and the Tar Ponds site by 2014. Final uses of the Tar Ponds and Coke Ovens Sites are not part of the proposed project.

Part II - Components of the Review Process

1. The Agency and NSEL shall develop joint draft guidelines for the preparation of the Environmental Impact Statement building on the preliminary guidance contained in the document entitled "Remediation of the Sydney Tar Ponds and Coke Oven Sites – Draft Scoping Document" prepared by Public Works and Government Services Canada in consultation with Environment Canada and Transport Canada and dated February 2005. The public and stakeholders shall be provided with 30 days to review the draft guidelines and provide comments to the Agency and Nova Scotia Environment and Labour.
2. Within 30 days of the close of the comment period specified in clause 1, after taking into account the comments received by the public and stakeholders, the Parties shall issue the Environmental

Impact Statement guidelines (the Final Guidelines) to the proponent,

3. The Parties shall require the proponent to prepare the Environmental Impact Statement in accordance with the Final Guidelines issued by the Parties. The Parties expect the Proponent to submit the Environmental Impact Statement to the Joint Review Panel no later than December 30, 2005
4. The Joint Review Panel shall require the proponent to distribute the Environmental Impact Statement for examination and comment by the public and stakeholders to determine whether additional information should be provided before convening public hearings. The Environmental Impact Statement shall be made available for public examination and comment for a period of 48 days.
5. Written comments received pursuant to clause 4 shall be made public and be provided to the proponent by the Joint Review Panel within two days. The proponent shall, as appropriate, provide to the Joint Review Panel its response to the written comments not later than 14 days following completion of the period for public examination and comment.
6. Should the Joint Review Panel identify deficiencies after reviewing the Environmental Impact Statement, and in consideration of any comments received from the public, stakeholders or the proponent pursuant to clauses 4 and 5, the Joint Review Panel may require additional information it deems necessary from the proponent. Any request for additional information shall be issued within 14 days following the expiration of the period for public examination and comment described in clause 4 or 14 days following receipt of written comments from the proponent as described in clause 5, whichever occurs later.
7. The Joint Review Panel shall schedule and announce the start of its public hearings once it is satisfied that the necessary information has been provided; it shall provide public notice of 21 days prior to the start of the hearings. The hearings shall not exceed 21 days in duration. A longer period would require approval by both parties.
8. The Joint Review Panel will hold its hearings within the Cape Breton Regional Municipality.
9. The Joint Review Panel shall deliver its Report to the Parties to this agreement within 55 days following the close of the public hearings. The Parties will then make the Report public.

Part III - Scope of the Environmental Assessment and Factors to be Considered in the Review

The Minister of the Environment, Canada, and the Minister of Environment and Labour, Nova Scotia, have determined that the Joint Review Panel shall include in its review of the Project, consideration of the following factors:

- a. Purpose of the Project
- b. Need for the Project
- c. Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means

- d. Alternatives to the Project
- e. The location of the proposed undertaking and the nature and sensitivity of the surrounding area
- f. Planned or existing land use in the area of the undertaking
- g. Other undertakings in the area
- h. The environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out.
- i. The significance of the effects referred to in h)
- j. The socio-economic effects of the Project
- k. The temporal and spatial boundaries of the study area(s)
- l. Comments from the public that are received during the review
- m. Steps taken by the proponent to address environmental concerns expressed by the public
- n. Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project
- o. Follow-up and monitoring programs including the need for such programs
- p. The capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future
- q. Residual adverse effects and their significance

APPENDIX C LIST OF ABBREVIATIONS AND ACRONYMS

BTEX	Benzene, toluene, ethylbenzene, xylenes
CAEL	Canadian Association of Environmental Laboratories
CBDC	Cape Breton Development Corporation
CBDHA	Cape Breton District Health Authority
CBRM	Cape Breton Regional Municipality
CEAA	Canadian Environmental Assessment Agency
CEM	Continuous Emissions Monitoring
CEPA	<i>Canadian Environmental Protection Act</i>
CCME	Canadian Council of Ministers of the Environment
CLC	Community Liaison Committee
CO	Carbon monoxide
CO ₂	Carbon dioxide
COC	Chemical of Concern
COPC	Chemical of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife In Canada
CSA	<i>Canadian Shipping Act</i>
CSP	Clean Soil Process
DFO	Fisheries and Oceans Canada
DNAPL	Dense non-aqueous phase liquid
NSEL	Nova Scotia Environment and Labour
EA	Environmental Assessment
EBAT	Economic Benefits Action Team
EBS	Economic benefits strategy
EC	Environment Canada
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
GCL	Geosynthetic clay liner
HADD	Harmful alteration, disruption or destruction of fish habitat permit
HASP	Health and Safety Plan
HC	Health Canada
HCL	Hydrochloric acid
HDPE	High density polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
HHRA	Human health risk assessment
HQ	Hazard quotient
HU	Hydro-stratigraphic unit
IMPACT	Model used to predict contaminant loadings
IR	Information request
ISCST 3	Industrial Source Complex Short Term - Version 3
JAG	Joint Action Group for the Environmental Cleanup of the Muggah Creek Watershed
JCI	Junior Chamber International
JDAC	Jacques, Dillon, ADI, CBCL consortium of engineers
JPA	Joint Panel Agreement

SYDNEY TAR PONDS AND COKE OVENS SITE REMEDIATION PROJECT

kg	kilograms
kJ	kilojoules
L/s	litres per second
m ³	Metres cubed
MAID	Municipal Ash Industrial Disposal
MEKS	Mi'kmaw Ecological Knowledge Study
mg/L	milligrams per litre
MPS	Municipal Planning Strategy
MOA	Memorandum of Agreement
NAPL	Non-aqueous phase liquid
NAPS	National Air Pollution Surveillance Stations
ng	Nanograms
NO _x	Nitrous oxides
NRCan	Natural Resources Canada
NSESA	<i>Nova Scotia Endangered Species Act</i>
NSTPW	Nova Scotia Department of Transportation and Public Works
NWPA	<i>Navigable Waters Protection Act</i>
OPEP	Oil Pollution Emergency Plan
PAH	Polycyclic aromatic hydrocarbon
PC	Public comment
PCB	Polychlorinated biphenyl
pg	Picograms
pH	measure of acidity or baseness of a liquid
PM	Particulate matter
psi	per square inch
PSL	Project significance level
PWGSC	Public Works and Government Services Canada
RA	Responsible Authority
RAER	Remedial Action Evaluation Report
SARA	<i>Species at Risk Act</i>
SOP	Standard Operating Procedures
SO _x	Sulphur dioxide
SPAR	Sydney Port Access Road
SSTL	Site-Specific Target Levels
STPA	Sydney Tar Ponds Agency
SYSCO	Sydney Steel Corporation
TC	Transport Canada
TCLP/LEP	Toxicity Characteristic Leaching Procedure/Leachate Extraction Procedure
TDE	TD Enviro Inc./Termo Design Engineering Ltd., St. Lawrence Cement Group, and Envirotech Consulting Inc.
TDP	Technology demonstration program
TEQ	Toxic equivalents quantity
TPD	tonnes per day
TPH	Total petroleum hydrocarbons
TSP	Total suspended particulate
VEC	Valued Ecosystem Component

ug microgram
USEPA United States Environmental Protection Agency
VJ Victoria Junction
VOC Volatile Organic Compounds

APPENDIX D PUBLIC HEARINGS

Registered Presenters:

- Public Works and Government Services Canada
- Fisheries and Oceans Canada
- Natural Resources Canada
- Environment Canada
- Health Canada
- Nova Scotia Natural Resources
- Office of the Medical Officer of Health
- Nova Scotia Environment and Labour
- Nova Scotia Transportation and Public Works
- Mr. Donald Deleskie
- Coalition retour à l'expéditeur - Return to Sender Coalition
- Cape Breton Save our Healthcare Committee
- Cape Breton District Health Authority
- Kipin Industries Inc.
- Grand Lake Road residents
- Cape Breton Development Corporation
- Cement Association of Canada
- Portland Cement Association
- Cape Breton University
- Dr. Ron MacCormick
- Sydney Academy
- JCI Cape Breton Chapter
- Sydney and Area Chamber of Commerce
- Cape Breton Partnership
- Eco-Canada
- Sierra Club of Canada
- Mr. Eric Brophy
- Ms. Debbie Ouellette
- Mr. Les Ignasiak
- TDE/TDV
- Ms. Marlene Kane
- Cape Breton Regional Municipality
- Bennett Environmental Inc.
- New Waterford and Area Fish and Game Association

APPENDIX E ACKNOWLEDGEMENTS

The Panel wishes to thank the many participants who played a role in the joint review Panel process for the Sydney Tar Ponds and Coke Ovens Sites Remediation Project. Through stakeholder involvement and input, the Panel gained valuable technical and community insights. The Panel enjoyed the many features Sydney has to offer and thanks the citizens of Sydney for sharing their renowned hospitality.

The Panel also thanks representatives of federal and provincial governments for sharing their expertise during the assessment.

The Panel would like to recognize Sydney Tar Ponds Agency and its consultants for their cooperative and professional manner throughout the process.

The Panel extends special thanks to its secretariat for its ongoing support during the review. They are as follows:

- Steve Chapman – CEAA Panel Advisor
- Peter Geddes – NSEL Panel Advisor
- Adrian MacDonald – Technical Analyst
- Debbie Hendriksen – Communications Advisor