

**Implementation of the Port Hope Area Initiative Biophysical and Socioeconomic
Environmental Assessment Follow-up Programs – 13209**

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ABSTRACT

The Port Hope Initiative (PHAI) involves the cleanup of historic low-level radioactive waste in various locations throughout the communities of Port Hope and Clarington, Ontario, as well as the construction of two engineered aboveground mounds for safe long-term management. The PHAI is comprised of two major projects – the Port Hope Project and the Port Granby Project. An Environmental Assessment (EA) was undertaken for each project and as a result EA Follow-up Programs were developed and are being implemented addressing both biophysical and socioeconomic aspects. This paper provides insight on elements of the EA Follow-up Program development, and its implementation.

INTRODUCTION

The PHAI represents the Government of Canada's commitment to respond to the community-recommended solutions for the cleanup and local, long-term, safe management of the historic low-level radioactive waste (LLRW) in the Municipality of Port Hope and in neighboring Port Granby, located in the Municipality of Clarington. A legal agreement, finalized in March 2001, between the Municipality of Port Hope, the Municipality of Clarington and the Government of Canada, launched the PHAI by defining the framework and setting out the responsibilities for the Port Hope Project and the Port Granby Project.

From 2001 to 2008, the projects were managed by the Low-Level Radioactive Waste Management Office (LLRWMO). In 2009, Natural Resources Canada (NRCan), Atomic Energy of Canada Limited (AECL) and Public Works and Government Services Canada (PWGSC) formed the Port Hope Area Initiative Management Office (PHAI MO) to carry the projects through to completion.

In 2012, Phase 2 Construction and Development was authorized. So far, access roads have been built and the construction of two waste water treatment plants (one for each project) has been initiated. Tenders for the construction of the long-term waste management facilities (LTWMFs) will be called in 2013 and the work of remediating sites and placing LLRW within the engineered mounds established at the LTWMFs will continue through 2021-2022. These mounds are designed to manage the waste safely for hundreds of years.

ENVIRONMENTAL FRAMEWORK

The framework for managing and protecting the environment while the Port Hope and Port Granby Projects are implemented is defined by two main pieces of legislation. The *Canadian*

Environmental Assessment Act (CEAA), 1992 established the parameters for the review of project effects, and guided the preparation of the environmental assessment (EA) study reports by the proponent AECL; the preparation of the Screening Reports by the federal Responsible Authorities (RAs); and the definition of the EA Follow-up Program which is the focus of this paper. The RAs are NRCan (project sponsor); Canadian Nuclear Safety Commission-CNSC (nuclear regulator); and Fisheries and Oceans Canada (authority for harbours – applies to Port Hope Project only).

The second piece of legislation governing the protection of the environment is the *Nuclear Safety and Control Act*, 2000. Administered by the CNSC, and manifested in the conditions it imposes in the licences for the Port Hope and Port Granby Projects, the CNSC's concerns are protection of the environment, safe handling and management of radioactive waste materials, as well as minimizing negative impacts of projects on local communities. The licences were issued for the respective projects in 2009 (amended in 2012) and 2011. Many of the environmental requirements stipulated in the licences overlap with the requirements stemming from the CEAA and its regulations, thus reporting of environmental monitoring results and mitigation measures is jointly made to the CNSC and to the RAs.

While closely related, the Port Hope and Port Granby Projects were subject to separate EA processes, both of which were completed with substantial involvement of communities and jurisdictional authorities. The Screening Report for the Port Hope Project was completed in 2007 while that for the Port Granby Project was concluded in 2009. Both Screening Reports, like the Study Reports that informed them, firmly concluded that neither project is likely to result in significant adverse environmental effects with mitigation measures taken into account.

In rendering their decisions on the Screening Reports, the RAs assigned responsibility for preparing the mandatory EA Follow-up Program Plans to the proponent AECL, and retained review and approval authorities. The purpose of the EA Follow-up Programs is to confirm that the environmental effects of Port Hope and Port Granby Projects are consistent with the predictions of the EA and, if not, to identify measures to further address those effects. Thus, the specific objectives of the Follow-up Programs, as outlined in the EA Screening Reports, are as follows:

- Verify the accuracy of predictions;
- Confirm the implementation of mitigation measures;
- Assess the efficacy of the mitigation measures; and
- Identify any unanticipated environmental effects.

The EA Follow-up Program is required until the predictions in the EA concerning effects are confirmed and the effectiveness of mitigation measures is verified. For the Port Hope and Port Granby Projects, this will extend until the construction and remediation activities have been concluded.

EA FOLLOW-UP PROGRAMS

Responsibilities and Objectives

In 2010-11, the EA Follow-up Program Plans were developed by AECL and approved by the RAs. In addition to meeting the objectives stipulated in the Screening Report, these Plans incorporated the requirements from the Screening Reports as well as the licensing provisions.

Workshops were held in each community (several of them in Port Hope) to explain the purpose of the EA Follow-up Programs, to confirm aspects of the environment that were valued by communities, and to gather input. Representatives from the host municipalities, business and community groups, and Aboriginal groups were among the many that participated.

Once the plans were developed, the baseline conditions that had been first measured as part of the EA Study from 2002-2005 were re-established. That is, the pre-construction conditions of the environments in which the Port Hope and Port Granby Projects would take place – both socioeconomic and biophysical – were re-measured so that comprehensive and current benchmarks were available for comparison of the actual project effects once construction started. The new baseline data, measured between 2010 and 2012, also served to identify changes that had occurred in the environment in the previous 5-10 years, allowing a review of the proposed mitigation measures.

Contents of the Follow-up Program

The identification of key activities to incorporate within the Follow-up Program was based on regulatory principals of compliance, adaptive management and analysis, fish habitat monitoring and socioeconomic components of the environment. The types of Follow-up monitoring activities identified included pre-project monitoring to augment baseline data sets, confirmation of effects and the effectiveness of mitigation measures, the development of management plans, and further investigations.

As per the Screening Reports, during the development of the Follow-up Program the following elements were also considered:

- Regulatory input received during the EA;
- Stakeholder input received during the EA and during workshops;
- Monitoring and sampling details, such as location, frequency, parameters, program duration, action triggers, etc.; and,
- Opportunity for harmonizing the Follow-up activities with other monitoring programs such as compliance monitoring.

Part of designing and developing the Follow-up Program included developing the *Environmental Assessment Follow-up Program Plans*. The plan for each project provides the framework for the

development and implementation of the Follow-up Program based on the environmental assessment components outlined in the biophysical and socioeconomic environment. Further details on the implementation of these components were outlined in the *Socioeconomic Effects Management Program – Monitoring Plan* and the *Biophysical Effects Management Program – Monitoring Plan*.

The Biophysical Effects Management Program – Monitoring Plan incorporates the Follow-up monitoring requirements in the natural environment, human health and safety, and cumulative effects. The *Socioeconomic Effects Management Program – Monitoring Plan* incorporates the Follow-up monitoring requirements in the socioeconomic environment, Aboriginal interests, focused on traditional use of lands and resources, and cumulative effects.

Framework for Biophysical and Socioeconomic Effects Monitoring

The EA Follow-up Program Plan describes the Follow-up Program within two categories: the biophysical environment and the socioeconomic environment. The categories reflect the responsibilities for program implementation that will be assumed by the RAs. As was noted in the *EA Screening Report*, NRCan is the lead agency for the socioeconomic elements of the Follow-up program while the CNSC is the lead agency for the biophysical elements of the Follow-up program.

Biophysical Effects Monitoring Program

The biophysical effects Follow-up Program includes the following environmental aspects, each of which is described below:

- Atmospheric;
- Geology and Groundwater;
- Aquatic;
- Terrestrial;
- Human Health and Safety; and,
- Cumulative Effects

Atmospheric Environment

During the EA assessment, air dispersion and noise modelling were used to predict air quality and noise levels during the project construction phase and the effects on the Atmospheric Environment. To provide an appropriate basis for evaluating predicted versus observed effects, baseline conditions were examined in the pre-construction phase through the baseline monitoring program in 2010 to 2011. Observed deviations from the baseline, or potential effects, will continue to be monitored during the Construction and Development Phase when it would be expected there might be the greatest potential for environmental effects, and compared against the predicted effects. Figure 1 shows the deployment of noise monitoring equipment while Figure 2 shows the ambient air monitoring and real-time air monitoring.

During the pre-construction phase, a dust management plan was completed. The plan requires three levels of monitoring, Prime Construction Contractor, Independent Dust Monitoring Consultant, and PHAI MO oversight. Figure 3 shows the Independent Consultant real-time monitoring of dust.

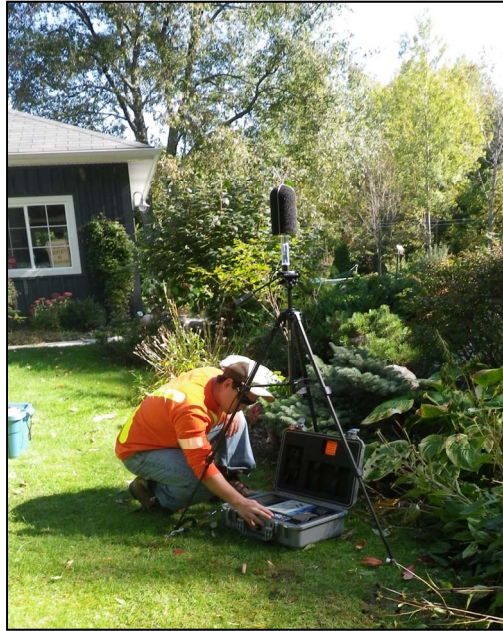


Figure 1: Noise Monitoring



Figure 2: PHAI MO air monitoring
Left: Hand-held real-time dust monitor
Right: High volume air sampler at site perimeter



Figure 3: Independent Consultant real-time dust monitoring

Geology and Groundwater Environment

The Geology and Groundwater Environment Follow-up Program includes monitoring of groundwater quality, groundwater flow and drainage water quality and the verification of predicted effects on soil quality. More than 170 wells were monitored in the pre-construction phase (Figure 4) and a comprehensive groundwater monitoring plan is currently being implemented.



Figure 4: Groundwater Monitoring

Aquatic Environment

A series of stream and lake water quality models were developed during the EA. Baseline monitoring conditions included water quality (radiological and non-radiological parameters) relative to the different sites, surface water flow, stream profiles, and sediment quality in a variety of creeks and Lake Ontario. Monitoring continued from 2010 to 2011 to establish baseline conditions and will continue during the construction phase. Figure 5 shows PHAI MO Environmental Technicians sampling a creek.

Terrestrial Environment

Terrestrial environment Follow-up Program activities have primarily focused on minimizing the project footprint and associated loss of vegetation communities, and maximizing the effectiveness of site remediation. During the pre-construction phase trees, birds, and species at risk were surveyed and documented. Monitoring of the presence and abundance of birds, amphibians, mammals will continue during the construction phase. A butterfly survey was completed for one site prior to construction to ensure seasonal migration was not impacted. An extensive species at risk monitoring program is being implemented to ensure the protection of all species at risk in Port Hope and Port Granby. Mitigation measures put in place include the rehabilitation of fish habitat, stream restoration, and species at risk protection. Additional rehabilitation/landscape planning will be undertaken as appropriate during the construction phase.



Figure 5: Surface-water quality monitoring



Figure 6: Terrestrial environment monitoring

Human Health & Safety

The EA Follow-up Plan relevant to human health evaluates both the radiological and conventional health and safety of workers and of members of the public. The monitoring program includes monitoring of radiation doses for workers and the public and oversight with regard to Occupational Health and Safety during the Construction and Development Phase. During construction activities, radiation doses to workers will be determined through a dosimetry program

under the PHAI Radiation Protection Plan. Doses to the public will be determined through calculation of exposures based on radionuclide concentrations in environmental media as measured through the related biophysical monitoring elements. For example, radon monitoring for approximately 77 locations have been conducted at residents' backyards and other sites as required. Soil samples have been collected and tested for radiological and conventional contaminants. Hi-Vols, Mini-Vols, and noise monitors have been deployed in many locations as part of the atmospheric Environment monitoring. These monitoring activities will continue throughout the project duration.

Socioeconomic Effects Monitoring Program

The scope of the socioeconomic effects Follow-up Program includes monitoring the following:

- Real estate and property effects;
- Tourism and business;
- Traffic and transportation systems;
- Archaeological and heritage resources;
- Traditional use of land and resources; and
- Cumulative effects.

In some cases, the monitoring requirements include the provision to verify the implementation of mitigation measures, and where this is the case, the provision to verify the applicable mitigation measure is included as a specific feature of the monitoring plan.

Real estate and property effects

The PHAI MO has responsibility for administering the Property Value Protection (PVP) Program, the complaints resolution process, the communications program and the public attitude surveys. Accordingly, PHAI MO has drawn on the information collected through these programs for real estate and property effects monitoring. The purpose of this type of monitoring is to determine the effects of the project on the local property markets, and to capture any concerns that residents may have regarding the project.

The PVP Program is designed to compensate owners of residential, commercial or industrial properties in designated parts of the municipalities of Port Hope and Port Granby, if they realize financial loss on the sale or rental of their property, or mortgage renewal difficulties as a result of the project. It was predicted in the EA that 2 to 8% decrease in residential property values and prolonged property marketing times would result from project effects. Tracking of real estate values determines if such effects remain in the predicted parameters. The required Follow-up activity is to monitor new and resale housing to verify impact on property values.

Since 2002, the PHAI MO has commissioned annual public attitude surveys to monitor public awareness of the PHAI, identify issues and concerns, determine communication needs of the

public, and provide data regarding public attitudes. The results of these surveys are available for the public and are published on the PHAI MO website.

Various mitigation measures are implemented to minimize impacts on the two communities. Landscaping (including privacy fences) and tree planting are examples of mitigation measures implemented to minimize negative effects on the viewshed for residents (Figure 7).



Figure 7: Tree planting for visual barriers

Tourism and business

The Follow-up activities associated with the tourism industry and business community involve monitoring conditions in tourism and business activities in order to determine any project-related effects and to verify any mitigation measures adopted as a result thereof. A baseline tourism survey was completed for spring, summer and fall of 2011 for Port Hope and Port Granby. Tourism conditions monitoring will continue throughout the duration of the project.

Traffic and transportation

During the EA, transportation and haulage routes were chosen that minimize the impacts on both communities. Figure 8 shows the chosen transportation routes for Port Granby and Figure 9 shows the chosen transportation routes for Port Hope. The EA Follow-up Program includes monitoring traffic and transportation and any project-related accidents along the transportation routes and the assessment of the quality of roads and bridges. Mitigation measures range from resurfacing of transportation routes to the modification of traffic signals to facilitate the flow of vehicles through intersections.

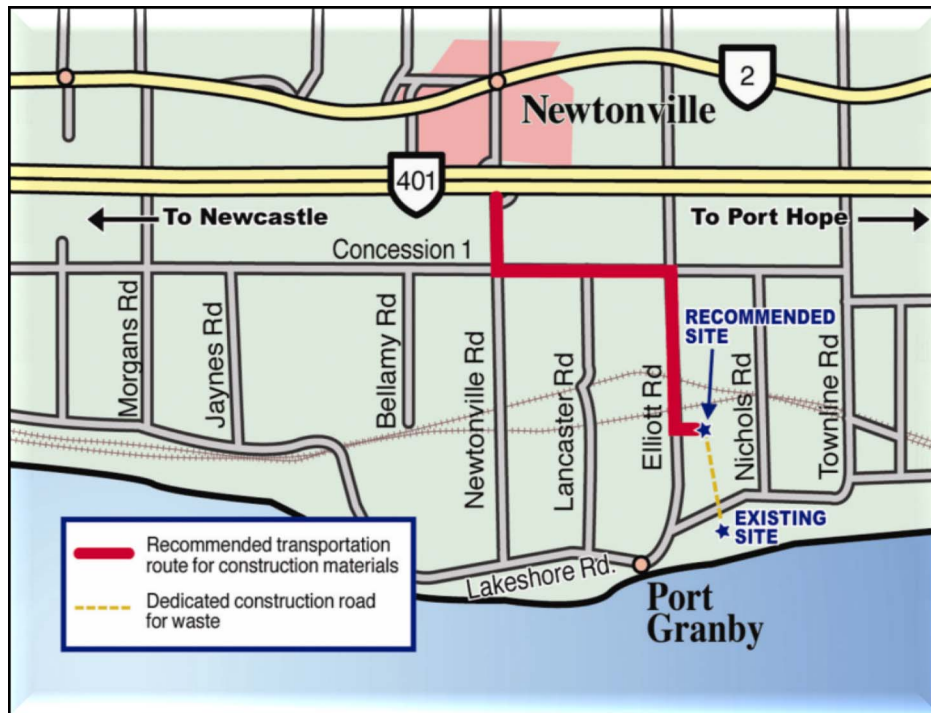


Figure 8: Transportation route for Clean Materials - Port Granby

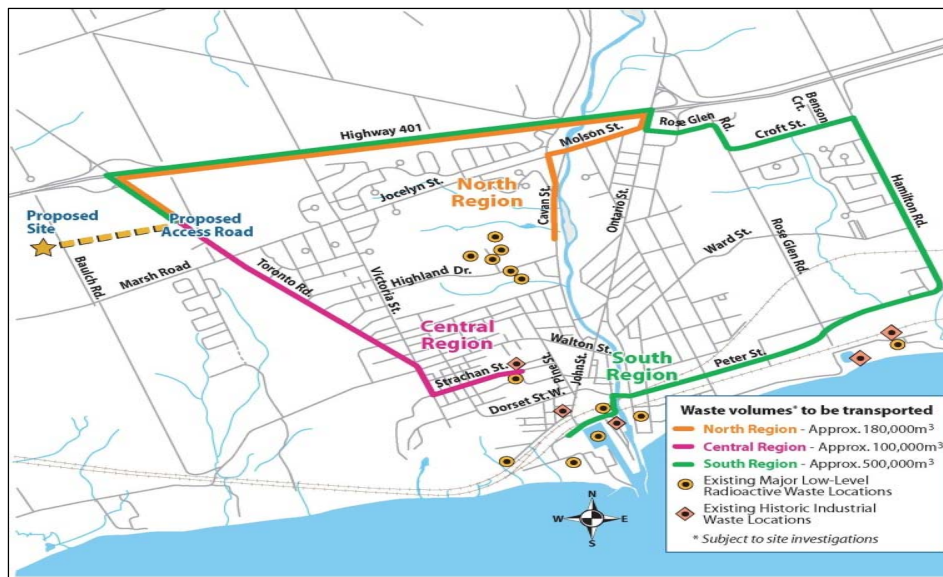


Figure 9: Transportation routes for Waste and Clean Materials - Port Hope

Archaeological and heritage resources

Prior to construction activities and during construction site preparation, a licensed archaeologist was retained to complete archeological assessments (Figure 10). During excavation activities, it is the responsibility of the archaeologist to identify, protect, document and preserve any artifacts that are discovered. Project operational protocols include provision to stop work immediately and notify the archaeologist if heritage resources or human remains are encountered.

An archaeologist was also retained as part of the EA Follow-up work to train construction crews to assist them in understanding the operational protocol to provide knowledge on how to identify the different archaeological objects if encountered during excavation work.



Figure 10: Archeological assessment

Traditional use of land and resources

The assessment of potential effects on the interests of Aboriginal groups was derived from the results of the assessment of effects on the Aquatic and Terrestrial Environments, and from consultation with Aboriginal groups during the EA and through their participation in workshops to develop the follow up Program Plan.

The assessment of effects on the Aquatic and Terrestrial Environments concluded that given the proposed mitigation measures, no significant adverse effects are likely to result. The Follow-up activities that pertain to Aboriginal interests involve the interpretation of the monitoring results of the Biophysical Effects Management Program as they relate to heritage resources and traditional resource use. The commitment to an extensive maintenance and monitoring program, over the life of the LTWMF, will serve to further mitigate the potential for effects on future generations of Aboriginal Peoples.

The PHAI MO has made continuous and fruitful efforts to establish communication channels with key Aboriginal groups in order to incorporate their input into pertinent project components.

Continued information and communication programs throughout the project keep the Aboriginal Peoples well informed of current project activities. In addition an award program was established to be offered to a Grade 3 Curve Lake school graduating student every year during the 10-year project.

Cumulative Effects

Cumulative effects are considered in the context of *CEAA* as the effects of the Project in combination with overlapping effects of other projects or activities. Although there are no significant adverse cumulative effects predicted from the Project, the follow-up activities will be carried out to re-affirm this prediction. The EA follow-up monitoring activities with respect to Cumulative Effects involve monitoring conditions in the Atmospheric Environment and traffic volumes that may contribute to nuisance effects from dust, noise and traffic. These follow-up monitoring requirements are incorporated within the Atmospheric Environment Follow-up Program and the socio-economic Follow-up Program. Radon levels are measured along the LTWMF perimeter as well as at several locations at a distance from the LTWMF. Dust (total suspended particulate, TSP) levels are measured along the LTWMF fence line and analyzed for radiological constituents. These measured concentrations include background plus the portion associated with the project as well as the contribution(s) associated with any other projects or ongoing activities underway concurrently with the Project. In addition traffic, air quality, noise monitoring, public attitudes are considered in the Follow-up activities.

Public Involvement

Stakeholder input received during the EA was considered during the of design the Follow-up Programs. Results of the Follow-up Programs have been publicized via the Information Public Exchange area available at the PHAI MO and on-line via the website www.phai.ca. Also, social media, such as facebook and twitter have been and continue to be utilized to inform the public.

Stakeholder input and involvement continues to be priority for PHAI MO. In addition to the liaison group meetings, many open houses and workshops are regularly held by PHAI MO. An extensive outreach program has been developed which factors in regular public input to ensure open dialogue with the communities and transparency of the project.

Mitigation Measures

The EA Follow-up Program is intended to: ensure that mitigation measures are implemented where identified in the EA; establish systems and procedures for this purpose; monitor the effectiveness of mitigation measures; and, take any necessary action when unforeseen impacts occur or when mitigation measures are not performing as expected.

Mitigation measures are actions taken to avoid, reduce the severity of, or eliminate an adverse impact. Mitigation can include: avoiding impacts, minimizing impacts by limiting the degree or magnitude of the action, restoring or rehabilitating the affected environment, reducing or

eliminating impacts over time; and, compensating by providing offsetting resources or environments.

The PHAI MO has implemented and continues to implement mitigation measures at different stages of the project. Different elements of mitigation were included in the 2001 legal agreement to help off-set impacts and to enhance local benefits to the communities. A cash grant in the amount of C\$10 million was provided to municipal signatories, to enable them to address, as they see fit, the impacts of the presence of LTWMFs within their communities.

The PVP Program was established to allow property owners to seek compensation if they realize financial loss on the sale of their property, lose rental income, or have difficulty renewing their mortgage at fair market value due to project effects. The complaint resolution program was established to address other impacts and has been developed for Phase 2 into a two-tier process.

A comprehensive dust management plan was implemented to establish control and action limits and work stoppage requirements to ensure dust levels are kept within those limits. Management measures also include washing construction vehicle wheels to limit dust traveling offsite. Dust from access roads is controlled by paving, and by applying water or mist (from water trucks), as necessary, to control dust during construction. Various requirements were imposed on contractors, including the speed limits and GPS tracking systems for waste delivery vehicles, and the expectation that all construction equipment meets Off-Road Compression-Ignition Engine Emission Regulations for use in areas of denser urbanization.

Noise mitigation includes limiting contractor working hours to established local municipal by-law requirements. Requirements were imposed on construction equipment to comply with emission standards as outlined in NPC-115 of the Ontario Model Municipal Noise Control By-Law. Trucks and other equipment are required to be equipped with mufflers. Empty trucks will be required to reduce speed at construction sites and on local roads to avoid excessive cargo box and tray noise.

A comprehensive list of mitigation measures is included in both the biophysical and socioeconomic monitoring Plans. The Follow-up Program is implemented to ensure the mitigation measures proposed to reduce the adverse biophysical and socio-economic effects of the project are having the desired effect.

Other Considerations

The results of a Follow-up Program may be used for implementing adaptive management measures and improving the quality of future environmental assessments. Adaptive management is an approach for responding to the actual monitoring data being received. If, for instance, monitoring indicates an environmental protection measure such as dust reduction at the LTWMF construction sites is not working as expected, the adaptive management provisions ensure the changes needed to improve dust control practices will be made and monitoring will be adjusted.

Annual reports are compiled that document the required Follow-up monitoring records gathered for the biophysical and socioeconomic environments.

CONCLUSION

The EA Follow-up Program, for the Port Hope Area Initiative, is a requirement under the *Canadian Environmental Assessment Act* to ensure that the mitigation measures identified through the Environmental Assessment for the project are effectively implemented.

Baseline studies have been completed during the pre-construction phase in 2010 to 2012. A substantial Follow-up Program will extend throughout the Construction and Development Phase. The PHAI MO has identified a number, and variety of monitoring programs and ongoing activities for both the biophysical and socioeconomic environment that will be carried out. Reports will be generated and submitted to the RAs on an ongoing basis to document EA Follow-up activities.

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