

8.0 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS

8.1 OBJECTIVE AND APPROACH

Section 16(1) of the *CEAA* requires the consideration of cumulative environmental effects in relation to a project. This chapter provides an assessment of the cumulative effects of the PNGS B Project in combination with other projects and activities at the PN site or off site in the vicinity of the PN site.

The Canadian Environmental Assessment Agency's Cumulative Effects Assessment Practitioners Guide (Cumulative Effects Assessment Working Group and AXYS Environmental 1999) and Operational Policy Statement (1999) provides guidance in conducting an assessment of cumulative effects to meet the regulatory requirements. According to the Practitioners Guide, a cumulative effects assessment is:

“...an assessment of those incremental effects of an action on the environment when the effects are combined with those from other past, existing and future actions” (pg. A1).

As noted in the Practitioner's Guide, the identification of residual effects allows for cumulative effects to be assessed since only those project-environment interactions that result in residual effects can lead to a cumulative effect. The Guide suggests that a cumulative effects assessment for a single project under regulatory review should fundamentally accomplish the following:

- 1. Determine if the project will have an effect on a Valued Ecosystem Component (VEC);*
- 2. If such an effect can be demonstrated, determine if the incremental effect acts cumulatively with effects of other actions, either past, existing or future;*
- 3. Determine if the effect of the project, in combination with the other effects, may cause a significant change now or in the future in the characteristics of the VEC after the application of mitigation for that project” (pg. 10).*

In the case of the PNGS B Project, the cumulative effects would be those incremental residual effects caused by the Project when added to or combined with the effects that are caused by other projects or activities at the PN site as well as off site.

There are three steps to the cumulative effects assessment:

1. Identifying projects or activities that could potentially interact with residual effects from the PNGS B Project (presented in Section 8.3).
2. Considering the likelihood for an interaction in terms of:
 - Similar effects from other projects and activities that might contribute to those caused by the PNGS B Project (Sections 8.4–8.8);
 - The time over which these potential interactions coincide (Sections 8.4.2 and 8.8.2); and
 - The geographic area in which the effects occur (Sections 8.4.3 and 8.8.3).
3. For the effects indicated, determining whether there is overlap in time and space, and where that occurs, the resultant overall cumulative effect and its significance (Sections 8.4.5, 8.8.5, and 9.3).

8.2 IDENTIFICATION OF EFFECTS TO BE CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT

As noted in Section 8.1, the first step of the cumulative effects assessment is to determine if the project could have an effect on a VEC (the selection of VECs is discussed in Section 3.3.2 and throughout Chapter 4.0). Feasible mitigation measures are identified that may be applied to reduce, eliminate or control any likely adverse effects on the VECs. A further assessment is then made to determine whether or not there is a residual adverse effect (i.e. an effect that remains after mitigation). These are the residual effects that were identified and described in Chapter 5.0.

Table 8.2-1 summarizes the resulting determination of adverse residual effects of the PNGS B Project and relevant VECs for consideration in the cumulative effects assessment.

**TABLE 8.2-1
ADVERSE RESIDUAL EFFECTS OF PROJECT AND RELEVANT VECs**

Environment Component	Likely Adverse Residual Effects	Relevant VECs
Atmospheric Environment	No Residual Effects.	N/A
Surface Water Resources	No Residual Effects.	N/A
Aquatic Environment	Loss of aquatic biota from impingement and entrainment for Continued Operation Phase.	Round whitefish, lake trout, northern pike, walleye, smallmouth bass, emerald shiner
Terrestrial Environment	No Residual Effects.	N/A
Geology, Hydrogeology and Seismicity	Tritium in groundwater associated with maintenance and repair during normal operations of auxiliary systems.	Potential pathway to member of the public, and potential pathways to aquatic and terrestrial environments
Radiation and Radioactivity	Collective doses to workers (NEWs) carrying out refurbishment activities higher than collective dose associated with normal operations.	Workers (NEWs)
Visual Setting and Transportation	Increased local traffic due to additional workers during Refurbishment Phase.	Members of the Public
Physical and Cultural Heritage Resources	No Residual Effects.	N/A
Socio-Economic Conditions	Changes to regional labour market during Refurbishment Phase.	Employment
	Reduced use and enjoyment of community and recreational features in vicinity of PNGS during both phases of the Project.	Recreational and community features/resource use
	Additional involvement of local fire, police and related services.	Health and safety facilities and services
	Decreased use and enjoyment of property during Refurbishment Phase.	Use and enjoyment of property
Aboriginal Interests	No Residual Effects.	N/A

(N/A – not applicable).

As shown in Table 8.2-1, there are eight adverse residual effects identified. In addition, the cumulative effects of radiation and radioactivity (i.e., dose to humans and non-human biota) under normal operating conditions are considered in this cumulative effects assessment, notwithstanding the conclusions presented in Section 5.9 and the TSD for Radiation and Radioactivity that there were no adverse residual effects during the Continued Operation Phase of the Project. The broadening of the scope of the cumulative effects assessment is in response to comments received from the public during the preparation of this EA Study Report. Some people expressed a concern that their health, safety and well-being may be affected by radiation and radioactivity due to PNGS B and other on-going operations at the PN site. Therefore, the effects of radiation dose on the three VECs (members of the public, workers and non-human biota) in the radiation and radioactivity environment have been carried forward into the cumulative effects assessment.

The cumulative effects assessment was further broadened to include potential cumulative effects associated with the continued presence of the thermal plume for the life of the station.

A cumulative effects assessment does not normally consider effects of serious malfunctions and accidents because they are hypothetical and have a very low probability of occurrence. This is consistent with the approach advocated in the Practitioners Guide, which states that, for the purposes of a cumulative effects assessment, the probability of such events (i.e., accidents and malfunctions) are too “rare” to be assessed together with those caused by normal operational activities.

8.3 IDENTIFICATION AND DESCRIPTION OF OTHER PROJECTS AND ACTIVITIES

To determine if the residual effects from the PNGS B Project have the potential to act cumulatively, and overlap with the effects of other projects and activities, either past, existing or future, a number of other projects and activities on and around the PN site have been identified.

The identification of these additional projects and activities is based on the Canadian Environmental Assessment Agency’s Operational Policy Statement, which indicates that the cumulative effects assessment should consider other ‘certain’ and ‘reasonably foreseeable’ projects. To this end, other certain or reasonably foreseeable projects and activities in the Regional, Local and Site Study Areas are considered if they are likely to involve, or represent, one or more of the following:

- An activity that occurs on or immediately adjacent to the PN property;
- A major change in an existing or on-going physical work or activity on the PN property;
- A source of additional radiation and radioactivity in the air, land or water that may contribute to radiological doses to humans and non-human biota;
- Other projects within the Regional Study Area likely to generate nuisance effects related to increased traffic;
- Other projects within the Regional or Local Study Areas likely to result in increased impingement and entrainment of fish;
- Other projects or activities within the Regional or Local Study Area that may result in additional thermal loadings to Lake Ontario;
- Other projects within the Regional or Local Study Areas that may result in additional nutrient loadings to Lake Ontario;

- Other projects within the Site Study Area likely to result in release of tritium to groundwater;
- Other projects within the Regional or Local Study Areas likely to require construction labour;
- Other projects within the Regional or Local Study Areas likely to place increased demand on recreational and community facilities; and
- Other projects within the Regional or Local Study Areas that may contribute to a decrease in enjoyment of property.

A stakeholder workshop was held in November 2006 to discuss topics related to cumulative effects and significance criteria (details are provided in Chapter 10 and in the Community and Stakeholder Consultation and Communication Program TSD). At that workshop stakeholders provided a preliminary list of projects or activities that they deemed relevant to the cumulative effects assessment for the PNGS B Project. Table 8.3-1 provides the projects or activities identified by stakeholders at the workshop and assumed rationale for inclusion. The EA Study team screened these projects and activities for applicability to the cumulative effects assessment for this Project. Table 8.3-1 indicates that six of these activities have been forwarded for further assessment.

**TABLE 8.3-1
PROJECTS AND ACTIVITIES IDENTIFIED AT STAKEHOLDER WORKSHOP**

Project or Activity	Assumed Rationale for Inclusion	Screening Decision
St. Mary's Cement	<ul style="list-style-type: none"> • A source of additional contaminants to Lake Ontario • A source of dust due to on-going operations 	<ul style="list-style-type: none"> • No adverse residual effects were identified for VECs related to air quality or surface water; therefore, no potential for cumulative effects.
Auto plants	<ul style="list-style-type: none"> • Potential for decline in the industry, resulting in less demand for electricity 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Closure of industry	<ul style="list-style-type: none"> • Potential closures of large industrial facilities, resulting in less demand for electricity 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Change in socio-political climate	<ul style="list-style-type: none"> • Potential for increased risk of terrorist threat 	<ul style="list-style-type: none"> • Security and safeguards are regulated by the CNSC. A general discussion of security systems and procedures is provided in the EA Study Report.
Nuclear stations on US side	<ul style="list-style-type: none"> • If built, additional effect on Lake Ontario, resulting in increased amounts of contaminants in the lake 	<ul style="list-style-type: none"> • No adverse residual effects were identified for VECs related to surface water; therefore, no potential for cumulative effects.
Construction industry	<ul style="list-style-type: none"> • A source of potential competition for workers and materials 	<ul style="list-style-type: none"> • The socio-economic effects assessment identified increased competition for construction labour as an adverse residual effect; therefore, this activity is forwarded for assessment of cumulative effects.
Other sources of industry (conservation)	<ul style="list-style-type: none"> • Potential reduction in demand for electricity 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Influenza pandemic	<ul style="list-style-type: none"> • Potential for decreased demand for electricity • Decreased availability of nuclear operators 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study. • OPG has procedures to ensure the safe operation of the reactors under various scenarios. This type of analysis is beyond the scope of the EA Study.
Durham Strategic Energy Alliance Activities	<ul style="list-style-type: none"> • Potential reduction in demand for electricity 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Community growth (Seaton, infill development)	<ul style="list-style-type: none"> • A source of additional traffic and traffic-related emissions • Potential for changes to emergency management planning • A source of increased stress on infrastructure and community amenities • A source of potential competition for workers and materials 	<ul style="list-style-type: none"> • The transportation and socio-economic effects assessments identified these factors as adverse residual effects; therefore, forwarded for assessment of cumulative effects.
Space for continued waste management at PWWF	<ul style="list-style-type: none"> • Perceived lack of space for continued storage • Perceived lack of community acceptance for continued storage 	<ul style="list-style-type: none"> • Waste management has been the focus of recent previous EA Studies, and OPG's long-term planning considers these effects. Waste management activities are part of the PNGS B Project.

TABLE 8.3-1 (Cont'd)
PROJECTS AND ACTIVITIES IDENTIFIED AT STAKEHOLDER WORKSHOP

Project or Activity	Assumed Rationale for Inclusion	Screening Decision
New Pickering Airport	<ul style="list-style-type: none"> • A source of additional traffic and traffic-related emissions • Potential for accidents involving aircraft at the PN site • A source of potential competition for workers and materials • A source of noise and air emissions. 	<ul style="list-style-type: none"> • The transportation and socio-economic effects assessments identified additional traffic and competition for workers as adverse residual effects; therefore, forwarded for assessment of cumulative effects.
407 extension	<ul style="list-style-type: none"> • Other construction project likely to generate nuisance effects such as dust, noise and traffic • Improved traffic flow • Potential for increased community growth 	<ul style="list-style-type: none"> • The transportation and socio-economic effects assessments identified these factors as adverse residual effects; therefore, forwarded for assessment of cumulative effects.
Expansion of water pollution control plant	<ul style="list-style-type: none"> • A source of additional nutrients to Lake Ontario, resulting in increased algae. 	<ul style="list-style-type: none"> • Algal growth is addressed in Chapters 5 and 6 of the EA Study Report. This has been forwarded for assessment of cumulative effects.
Darlington New Build and Existing NGS	<ul style="list-style-type: none"> • Other construction projects likely to generate nuisance effects such as dust, noise and traffic • Increase in traffic-related emissions • Potential for additional radiation dose to Durham Region residents • A source of new potential competition for workers and materials 	<ul style="list-style-type: none"> • The transportation and radiation and radioactivity effects assessments identified increased traffic and radiation dose to workers, respectively, for consideration in the cumulative effects assessment; therefore, forwarded for assessment of cumulative effects.
Growth of University of Ontario - Institute of Technology	<ul style="list-style-type: none"> • Implications for availability of operational workforce • Programs supported by continued operation of nuclear stations 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Ontario grid (black out)	<ul style="list-style-type: none"> • Potential for climate change and global warming to affect the function of the grid and to affect the operation of PNGS 	<ul style="list-style-type: none"> • The function of the grid is beyond the scope of this Project. • Effects of climate change on the Project are evaluated in the EA Study Report, Chapter 6.
Other industry on lake	<ul style="list-style-type: none"> • Source of additional contaminants in Lake Ontario 	<ul style="list-style-type: none"> • No adverse residual effects were identified for VECs related to surface water; therefore, no potential for cumulative effects.
Other water takers	<ul style="list-style-type: none"> • Potential for radionuclides from PNGS to affect Lake Ontario water taken by other industry • Potential for effects on water levels 	<ul style="list-style-type: none"> • No adverse residual effects were identified for VECs related to surface water; therefore, no potential for cumulative effects.
Other water/lake users	<ul style="list-style-type: none"> • Potential for contaminants to affect usage of Lake Ontario (e.g. recreational use) 	<ul style="list-style-type: none"> • No adverse residual effects were identified for VECs related to surface water; therefore, no potential for cumulative effects.
Coal plant shutdown	<ul style="list-style-type: none"> • Increased demand for nuclear power 	<ul style="list-style-type: none"> • Economic factor not related to the scope of the EA Study.
Climate Change	<ul style="list-style-type: none"> • Change to water levels • Change to storm events – flooding and levels of precipitation 	<ul style="list-style-type: none"> • Effects of climate change on the Project are evaluated in the EA Study Report, Chapter 6.

In addition to the projects and activities identified by stakeholders at the workshop, others were identified by the study team during the course of the EA study. Table 8.3-2 lists each of the projects and activities that are considered within this cumulative effects assessment, including those forwarded from the stakeholder workshop, and provides a summary rationale for why each has been included. The inclusion of projects in later steps in this assessment is based on the potential for some level of interaction with the PNGS B Project, regardless of whether their effects are likely to be significant.

Other projects or activities are grouped into two major categories:

- Past and existing projects and activities; and
- Certain/planned or reasonably foreseeable projects and activities.

**TABLE 8.3-2
OTHER PROJECTS AND ACTIVITIES CONSIDERED**

Project or Activity	Summary Rationale
Past and Existing Projects and Activities	
PNGS A Operations	<ul style="list-style-type: none"> • An activity that occurs on site or immediately adjacent to the PN property. • Contribution to fish impingement effects. • A source of additional radiation dose to humans and non-human biota. • Contribution to thermal plume related to PNGS.
DNGS Operations	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota. • Contribution to fish impingement effects. • Source of thermal loadings to Lake Ontario. • Potential source of tritium in groundwater.
Pickering Waste Management Facility – Phase I (PWMF I)	<ul style="list-style-type: none"> • An activity that occurs on site or immediately adjacent to the PNGS property. • A source of additional radiation dose to humans and non-human biota.
Recreational Fishing	<ul style="list-style-type: none"> • Additional effects on aquatic biota.
Non-OPG Facilities Licensed by CNSC	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota.
Certain/Planned or Reasonably Foreseeable Projects and Activities	
Pickering Waste Management Facility – Phase II (PWMF II)	<ul style="list-style-type: none"> • An activity that occurs on site or immediately adjacent to the PN property. • A source of additional radiation dose to humans and non-human biota.
Darlington Waste Management Facility (DWMF) Operations	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota.
DNGS Retubing	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota. • Source of additional nuisance effects such as traffic. • Additional demand for construction labour. • Continuing fish impingement effects.

TABLE 8.3-2 (Cont'd)
OTHER PROJECTS AND ACTIVITIES CONSIDERED

Project or Activity	Summary Rationale
Construction and Operation of New Nuclear Generating Station at Darlington Site	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota. • Source of additional nuisance effects such as traffic. • Additional demand for construction labour. • Additional fish impingement effects. • Additional thermal loadings to Lake Ontario. • Increase demand on recreational and community facilities. • Potential source of tritium in groundwater.
PNGS A Decommissioning	<ul style="list-style-type: none"> • An activity that occurs on site or immediately adjacent to the PN property. • A source of additional radiation dose to humans and non-human biota.
PWMF Decommissioning	<ul style="list-style-type: none"> • An activity that occurs on site or immediately adjacent to the PN property. • A source of additional radiation dose to humans and non-human biota.
DNGS Decommissioning	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota.
Darlington Waste Management Facility (DWMF) Decommissioning	<ul style="list-style-type: none"> • A source of additional radiation dose to humans and non-human biota.
Expansion of Duffin Creek Water Pollution Control Plant (WPCP)	<ul style="list-style-type: none"> • A source of additional nutrients to Lake Ontario.
Highway 407 East Completion	<ul style="list-style-type: none"> • Other construction projects likely to generate nuisance effects such as traffic. • Additional demand for construction labour.
Brock Road Expansion	<ul style="list-style-type: none"> • Other construction projects likely to generate nuisance effects such as traffic. • Additional demand for construction labour.
Active Development Proposals in the Vicinity of PNGS	<ul style="list-style-type: none"> • Other construction projects likely to generate nuisance effects such as traffic. • Additional demand for construction labour. • Increased demand on recreational and community facilities.
Pickering Airport Construction and Operation	<ul style="list-style-type: none"> • Other construction projects likely to generate nuisance effects such as traffic and traffic-related emissions. • Additional demand for construction labour. • A source of noise and air emissions during operation.
Growth in Regional Population and Economic Base	<ul style="list-style-type: none"> • Sources of increased traffic, stress on infrastructure, recreational facilities, schools, hospitals, etc. • Increased demand on Water Pollution Control Plants and source of additional nutrients. • Additional demand for construction labour. • Increased demand on recreational and community facilities.

Figure 8.3-1 summarizes the timelines for the various projects and activities described above over a period of 2005 through 2060 and beyond.

Figure 8.3-2 illustrates the location of the various projects and activities described above.

8.3.1 Past and Existing Projects and Activities

8.3.1.1 PNGS A Operations

PNGS A consists of four CANDU reactors (Units 1 through 4), the first of which was brought into service in 1971. These reactors are the most westerly of the total of eight similar reactors located on the PN site. In early 1998, all four reactors were placed in a lay-up state.

Following refurbishment, OPG returned two of the four PNGS A units (Units 4 and 1) to service over the period of 2003 to 2005, respectively. OPG has no plan to return Units 2 and 3 to service. The two refurbished units will likely continue to operate at least until the scheduled shutdown date of the first unit, after which each unit will be shut down. Current plans envisage that the two operational units may be permanently shut down starting in 2022. Radioactive emissions from the PNGS A operation are expected to contribute to radiation exposures to the same VECs subject to doses from the PNGS B Project. In addition, the continued operation of PNGS A will contribute to the thermal loading to Lake Ontario as well as to fish impingement.

8.3.1.2 Pickering Waste Management Facility Phase I (PWMF I)

OPG currently stores used fuel that has been cooled for at least ten years in the Irradiated Fuel Bays in Dry Storage Containers (DSCs) in PWMF I. The PWMF I is a shared facility between PNGS A and PNGS B and comprises two components: the Used Fuel Dry Storage Facility (UFDSF) for interim storage of used fuel in DSCs and the Pickering Retube Components Storage Facility (RCSF) for interim storage of irradiated reactor components in Dry Storage Modules (DSMs). The RCSF began operation in the mid-1980's and the UFDSF began operating in 1996. With the exception of periodic inspections, monitoring and maintenance of DSMs and the RCSF yard, there have been no operational activities at the RCSF since 1993. The concrete containers for used fuel are stored indoors, while the concrete containers for the re-tube components are stored outdoors. Assuming that a long-term waste management facility will be available, the PWMF (including the planned Phase II expansion) will continue to operate until approximately 2064, with decommissioning complete by approximately 2067. Used fuel will be shipped to the long-term waste management facility beginning in about 2035.

8.3.1.3 Darlington NGS Operations

The Darlington Nuclear Generating Station (DNGS) is located in the Municipality of Clarington, approximately 28 km east of PNGS. It consists of four CANDU reactors, the first unit of which has been in operation since 1990. These units are currently in operation and OPG plans to continue to operate them to the end of their 30-year operating lives, until approximately 2030. Radioactive emissions to the air and water from this station are of the same type as the emissions

from PNGS B. In addition, continued operation of DNGS will contribute to the thermal loading to Lake Ontario as well as to fish impingement.

8.3.1.4 Recreational Fishing

Recreational fishing near the PN property is popular among local residents, but is not a widespread activity among people living in the study area. Recreational boat fishing in the vicinity of the PN property has shown a significant and steady decline from approximately 750,000 to 300,000 angler-hours between 1986 and 1998 (MNR 1999). Most of the fishing effort occurs in July and August during the annual salmon derby.

The fall 1999 recreational fisheries survey undertaken for the PARTS EA (OPG 2000c) indicated that most of the fishing activity nearest the PN property was shore angling rather than boat angling. Of the shore angling sites, Frenchman's Bay was the most popular. At PN, smallmouth bass is targeted the most; at Frenchman's Bay, salmon and trout were most commonly targeted, but largemouth bass and common carp were most commonly caught. At the Rouge River, west of the PN site, the most prevalent catch was common carp (OPG 2002a).

8.3.1.5 Non-OPG Facilities Licensed by the CNSC in the Region

Within the Regional Study Area, numerous facilities are licensed by the CNSC to store and use radioisotopes for a wide variety of applications. These activities are ongoing and are expected to occur throughout the study timeframe (2010 through 2060). Within 5 km of the PN site, a total of three licensed facilities were identified. These are listed in Table 8.3-3. Sealed radioisotopes are used at all these facilities and would not be expected to release radioactivity to the environment. Within 20 km of the PN site, 100 licensed facilities were identified. Although these activities are not likely to involve the same radionuclides, emissions of radioactivity and radiation from these facilities potentially contribute to doses to humans and non-human biota.

**TABLE 8.3-3
OTHER CNSC-LICENSED FACILITIES WITHIN FIVE KM
OF THE PN SITE**

Licence Holder	Address	Use/Device
Durham Region Environmental Laboratory	901 McKay Road, Pickering	Electron capture detection devices
Nuclear Safety Services	757 McKay Road, Pickering	Calibration sources
Duffin Creek (York-Durham) Water Pollution Control Plant	901 McKay Road, Pickering	Servicing, installation and dismantling sources Fixed nuclear gauge

8.3.2 Certain/Planned or Reasonably Foreseeable Projects and Activities

The projects and activities identified for consideration in this cumulative effects assessment that are certain/planned or are reasonably foreseeable are described below. As recommended in the Practitioners Guide, projects and activities are considered to be ‘certain’ to occur because they:

- have been approved for development;
- have been announced by the proponent and /or regulatory agencies; or
- are currently under review for approval.

Project and activities are “reasonably foreseeable” because they:

- are identified in an approved development plan; or
- are not directly associated with the project under review but might proceed after the PNGS B Project is approved.

8.3.2.1 Pickering Waste Management Facility (PWMF II)

OPG has approval from the CNSC to construct and operate additional Used Fuel Dry Storage Buildings on the PN site in the East Complex. OPG proposes to transfer used fuel bundles that have been cooled for a minimum of ten years in the Irradiated Fuel Bays (IFBs) at PNGS A and PNGS B into Dry Storage Containers (DSCs) for processing and interim storage at the PWMF I and PWMF II. The PWMF II will have a service life of at least 50 years or until a long-term waste management facility for used fuel is available.

The PWMF II will be constructed entirely within the PN property. OPG has established a target in-service date of October 2008 for the PWMF II. Two DSC storage buildings (Storage Buildings 3 and 4) are to be built sequentially at the site, currently planned for construction in 2008 and 2016. Each DSC storage building will hold approximately 500 DSCs. The storage buildings will be single storey, commercial-type, pre-engineered or pre-cast concrete structures founded on a common concrete slab on grade. Under normal operating conditions, no airborne emissions are expected from the seal-welded DSCs that will be transferred from the existing PWMF I or IFBs. The external gamma dose rates to the public at the PN site boundary will be below 10 $\mu\text{Sv/y}$.

PWMF II will continue to operate until approximately 2064, with decommissioning complete by approximately 2067. Used fuel may be shipped to a long-term waste management facility beginning in about 2035.

8.3.2.2 Darlington Waste Management Facility (DWMF)

OPG has constructed a Waste Management Facility on the Darlington Nuclear property. The facility is expected to begin operating in mid-2007. Used fuel bundles are currently stored in water-filled bays at the Darlington NGS. OPG will transfer used fuel bundles that have been cooled for a minimum of ten years in the IFB at Darlington NGS into DSCs for processing and storage at the DWMF. This facility will have a service life of at least 50 years or until a long-term management facility is available. OPG has established a target in-service date of late 2007 for the DWMF.

A total of three DSC storage buildings and a processing building are to be built sequentially at the site over the life of the project. The first storage building and processing building have been built. Each DSC storage building will hold approximately 500 DSCs. Construction of the storage buildings will be phased in, as additional storage space is required with a new storage building being built approximately every eight years. The storage buildings will be single storey, commercial-type, pre-engineered or pre-cast concrete structures founded on a common concrete slab on grade.

8.3.2.3 DNGS Retubing

The possibility of extending unit life through replacement of the fuel channels (also known as retubing) is a consideration in the life cycle management of CANDU reactors. As such, the retubing of DNGS is considered to be reasonably foreseeable. The planned retubing project involves the replacement of reactor pressure tubes at DNGS and is tentatively planned to be between 2018 and 2021. Based on the experience of retubing PNGS A, this activity will not result in a substantial change in the types of radionuclides released from the station, nor in a substantial change in the dose to members of the public. This activity will extend the operation of the DNGS until approximately 2050.

8.3.2.4 Construction and Operation of a New Nuclear Generating Station on the Darlington Site

On September 22, 2006 OPG submitted an application to the CNSC for a licence to prepare a site for the possible construction of four additional nuclear generating units on the Darlington site. Within the next three years, an EA is anticipated to study the construction and operation of a new station at the Darlington site. The new facility will consider the current CANDU technology along with other technologies.

The provincial government will decide whether or not to propose the construction of a new station at Darlington. The CNSC is the licensing body for the construction and operation of a

nuclear generating station. Assuming both levels of approval to build are given, OPG has estimated that the Site Preparation and Construction Phase may take up to 16 years (2010 to 2026) assuming two phased developments of six to eight years each. The Operation Phase is expected to be approximately 60-70 years for each unit (i.e., 2016 to 2096), after which the Decommissioning and Abandonment Phase would occur for approximately 40 years (i.e., 2097 to 2137) once the last unit has reached its end of operating life.

As noted in Table 8.3-2, the effects of a new nuclear station would be similar to those from the existing DNGS. However a “new-build” would also place additional demand on the construction labour market.

8.3.2.5 PNGS A Decommissioning

The current preliminary decommissioning plan envisages having PNGS A in a safe storage state after 2024 for approximately 30 years. This would be followed by a dismantling stage over a ten-year period for each reactor unit spanning approximately 2050-2060. These activities will not result in a change in the types of radionuclides released from the station, but will likely change the amount of radionuclides released from the station. The PNGS A decommissioning process is expected to result in a staged reduction of material and radioactivity at the site. Radioactivity that could be released to the environment during dismantling will be reduced by radioactive decay during the storage period. A preliminary estimate of the occupational dose conducted in 1986 for decommissioning PNGS A is 5.3 person-Sv over the 30-year safe shutdown and dismantling period. The effect of decommissioning on the general public is expected to be smaller than the effect of normal operations; therefore, the cumulative effect over this time period is also expected to be smaller.

8.3.2.6 PVMF Decommissioning

In general, decommissioning the PVMF would begin after a decision is reached to cease storing radioactive materials on the site and after all the used fuel in the DCSs has been removed to a long-term waste management facility. For planning purposes, it has been assumed that a long-term facility is commissioned by 2035 and will operate until 2064.

8.3.2.7 DNGS Decommissioning

In preparing for decommissioning, the shutdown of DNGS is assumed to begin after its operating in-service period. Assuming that retubing (Section 8.3.2.3) does not occur, OPG envisages commencing progressive shutdown of all reactor units starting in 2017 through to 2019. In accordance with this reference plan, DNGS would be placed in a safe storage state commencing at the end of 2019 and spanning a period of approximately 30 years. This would be followed by an active decommissioning or dismantling stage over a ten-year period, spanning 2050-2060. These activities will not result in a change in the types of radionuclides released from the station, but will likely change the amount of radionuclides released from the station. As described above for PNGS A, the DNGS decommissioning process is expected to result in a staged reduction of material and radioactivity at the site, and of emissions and exposures to workers, the public and the environment. The radiological effects will be well below applicable regulatory limits. Furthermore, they are expected to be substantially less than the effects associated with operation and maintenance of DNGS.

The exact timing of the station's shutdown and decommissioning may change in the future, as different life extension options are considered. In particular, if DNGS is retubed, the station's shutdown/decommissioning will not occur until a later date.

8.3.2.8 DWMF Decommissioning

The DWMF EA Study Report indicated that the DWMF would be in operation until at least ten years after shutdown of the last of the four DNGS reactor units. The DWMF will continue to operate until approximately 2060, with decommissioning complete by approximately 2067. Used fuel will be shipped to a long-term waste management facility beginning in about 2035.

8.3.2.9 Expansion of Duffin Creek WPCP

The Duffin Creek Water Pollution Control Plant (WPCP) is located near the lakeshore in the City of Pickering, just west of the mouth of Duffins Creek about 1 km east of the PN site along the shore of Lake Ontario. It treats municipal wastewater from York and Durham Regions, and then discharges the treated effluent through a submerged pipeline and into Lake Ontario at a current capacity of up to 420 MLD (million litres per day). The plant has been built in stages with Stages I and II now in place.

The WPCP requires expansion to service population growth, with Stage III to provide for a total treatment capacity of 630 MLD. At Stage IV, the WPCP will eventually provide treatment for up to 727 MLD. These stepwise increases in capacity will result in increases in the volume of the effluent stream discharged to Lake Ontario, and have the potential to result in adverse water

quality impact (i.e., increased nutrient loading to Lake Ontario) (EcoMetrix 2006). Expansion of the Duffin Creek WPCP is planned from 2007 through 2010, and the planned operational life is to approximately 2037.

8.3.2.10 Highway 407 East Completion

Highway 407 currently ends at Brock Road in Brougham in the northern part of Pickering. The Ontario Ministry of Transportation has expressed its intention to complete Highway 407 east of Brock Road to Highway 35/115 in the Municipality of Clarington. This link will be built in the northerly portion of the City of Pickering in close proximity to the existing Highway 7 (Ministry of Transportation 2001).

Although the timing of this development is not known, the EA Study Report is expected to be submitted at the end of 2008 (TSH 2007), and construction is likely to begin a few years after this. For EA purposes, it has been assumed that the construction activity associated with the Highway 407 completion may occur between 2011 and 2015.

The completion of Highway 407 East will likely place additional demand on the construction labour force and generate nuisance effects from construction activities.

8.3.2.11 Brock Road Expansion

The Region of Durham Transportation Master Plan identifies a Priority Transit Network which comprises transit corridors and transportation centres (Dillon 2003). One of these corridors (a "Major Transit Corridor") is Brock Road between Highway 407/7 and the CP rail corridor extending south to Bayly Street. An improvement to Brock Road from Bayly Street to Highway 407/7 is expected to begin about 2012 and involve the widening of the road to four lanes, including the Brougham Bypass.

The widening of Brock Road will likely generate nuisance effects from construction activities, and place additional demand on the construction labour force.

8.3.2.12 Active Development Applications in the Vicinity of PN

Several active development applications in the vicinity of PN have been identified.

There are 12 development applications within the Local Study Area. One proposed development, the Bay Reaches, is a draft plan of subdivision for a townhouse and apartment complex located in the vicinity of Liverpool Road and Bayly Street in Pickering. The other 11

are in Ajax and include two draft-approved industrial applications, six draft-approved residential subdivision applications, and three pending residential subdivision applications.

The six draft-approved subdivisions in Ajax will provide a total of nearly 1,600 units within an area greater than 49 ha. Three of the subdivisions are defined as low density in the Official Plan based on housing type and units per hectare, while two are defined as medium density. An additional 179 units are proposed as part of the three pending plans.

For EA purposes, it has been assumed that construction activities associated with these applications may take place between approximately 2007 and 2011. These activities will likely generate nuisance effects (e.g. increased traffic) and place additional demand on the construction labour force. Once the subdivisions are completed, there could be increased demand on recreational and community facilities.

8.3.2.13 Pickering Airport

The Greater Toronto Airport Authority (GTAA) has developed a draft plan (GTAA 2004) for an international airport located in the northwest corner of the City of Pickering on their Pickering Lands. The closest community is Claremont. Planning for both the road network and utility infrastructure to service a Pickering Airport involves provincial, regional and municipal jurisdictions; however, to date specific plans have not been determined.

As described by the GTAA (GTAA 2004), initially the Pickering airport will service demand that exists due to the closures of Buttonville, Oshawa and Markham Airports. Facilities at the Pickering Airport will be further developed as the anticipated additional demand for air transportation service grows.

The Pickering Airport Draft Plan Report includes two conceptual site layouts including an “opening day” layout for 2012 and a fully developed layout anticipated for 2032. In the initial phase (Year 2012 Plan), development will primarily take place in the northern area of the proposed airport with the development of general aviation facilities including aircraft hangars, an apron, car parking, control tower and support facilities. In addition, one primary runway and one crosswind runway will be built. The Year 2032 Plan includes the development of three full runway layouts, a passenger terminal and apron, groundside parking, a control tower, de-icing facilities, a cargo area, airport support, aircraft maintenance and a general aviation area.

The construction phases of the airport project will generate nuisance effects such as traffic, dust and noise, and will place additional stress on the construction and labour market. The operation of the airport will also be a source of additional traffic, noise and air emissions.

8.3.2.14 Growth in Regional and Local Population and Economic Base

The City of Pickering, Durham Region, and other area municipalities have recently prepared population forecasts as part of their background work to prepare for additional growth and development. Municipalities in Durham Region are forecasting strong population and economic growth. Across the Region, population is forecast to grow by approximately 7% up to 2009; 54% by 2024 and 160% by 2060. Within the 50 km emergency preparedness zone, the population is predicted to increase by approximately 37% by 2025 and 97% by 2060 (see Table 5.12-4). Industrial, Commercial and Institutional (ICI) floor space in the Region of Durham is forecast to grow by 7% by 2009, 47% by 2024 and 128% by 2060. Across the Region, employment is forecast to grow by approximately 10% by 2009, 64% by 2021 and by 192% by 2060. The growth in the regional population and economic base is expected to result in increased residential, industrial, commercial and institutional developments and related infrastructure according to the existing official plans for each municipality.

Additional growth will result in increased traffic, increased demand on recreational and community facilities, and increased demand for construction labour. It will also put additional demand on the local Water Pollution Control Plant, thus increasing the amount of effluents (i.e., nutrients) into Lake Ontario.

8.3.3 Summary of Types of Effects Considered

The projects and activities identified in Sections 8.3.1 and 8.3.2 were linked to the environmental components for which adverse residual effects had been identified (Table 8.2-1). These components include the following:

- Aquatic Environment;
- Hydrogeological Environment;
- Radiation and Radioactivity;
- Transportation; and
- Socio-economic Conditions.

As noted in Section 8.2, the scope of the cumulative effects assessment was broadened to include potential cumulative effects associated with the thermal plume. Hence, Surface Water Resources is an additional environmental component under consideration.

Each of the six environmental components is discussed in Sections 8.4 to 8.9 inclusive. The discussion of Radiation and Radioactivity as well as Socio-economic Conditions is more detailed

than the others, due in part to public interest (Radiation) and in part to the finding of residual cumulative effects (Socio-economic Conditions).

8.4 SURFACE WATER EFFECTS

The combined thermal plume from PNGS A and B, based on a criterion of 2°C above ambient, is typically within approximately 8 km of the station, covering an area of 150 to 800 ha at the water surface regardless of warm or cold weather conditions. Because of the limited extent of the thermal plume from PNGS, there is not likely to be a spatial overlap with either the existing DNGS or the proposed “New Build” at the Darlington site.

During the Refurbishment Phase, as the reactors are shut down, the extent of the thermal plume from PNGS B will decrease somewhat from current conditions. When the last PNGS B reactor is refurbished and returned to service, the extent of the thermal plume will return to existing conditions. However, at about this same time, the PNGS A reactors will begin to shut down at their end of life, resulting in a reduced combined thermal plume.

The thermal plume itself does not have a direct effect on human health; however, it can contribute to the growth of bacteria and aquatic biota such as filamentous algae. As discussed in Section 4.12, under current conditions there is a very low probability that the combined thermal plume from PNGS would increase *E.Coli* growth in Lake Ontario near the Ajax WSP. As indicated in Section 5.6, the thermal plume likely contributes to the growth of filamentous algae in the spring and fall within approximately 3 km of the facility due to an extended growing season, partly as a result of warmer lake temperatures from the thermal plume. However, the increase in algal growth is also a function of many other factors, such as an increase in suitable substrate due to zebra and quagga mussels, increased levels of nutrients from sewage treatment discharges, and urban and rural runoff. Under current conditions the thermal plume is only a small contributor to algal growth and its contribution will diminish during both phases of the Project

Another project that may contribute to the bacterial and algae growth is the expansion of the Duffin Creek Water Pollution Control Plant (WPCP) to address the need for more capacity at the plant due to projected population growth. This will result in increased nutrient (phosphorous and ammonia) loadings to the local area. The decision from the Minister of the Environment on the Environmental Assessment for the Duffin Creek Water Pollution Control Plant (Letter from Laurel Broten, Minister of the Environment to Mr. Bruce Macgregor Commissioner of Transportation and Works and Mr. Cliff Curtis – Commissioner of Works; 21 March 2007) indicates that “*an environmental assessment will have to be carried out to address the limitations of the existing outfall/diffuser and to construct the preferred outcome*”. While a longer

outfall/diffuser pipe will not decrease the overall loading of nutrients to Lake Ontario, it may reduce the existing effects of nutrient loading to the area in the vicinity of the PNGS and the WPCP.

Another contributor to the growth of bacteria and aquatic biota is climate change. Current climate predictions indicate that surface water temperatures in Lake Ontario may increase by 3 to 5°C by 2050.

OPG and the Regions of York and Durham have commissioned a study to assess the sources of the algae affecting the area near the PNGS and to determine whether the Duffin Creek WPCP and/or PNGS's emissions are the main contributors to algal growth in the area.

8.5 AQUATIC ENVIRONMENT EFFECTS

The cooling water (CW) intake flows, and therefore impingement and entrainment effects, will be reduced during the PNGS B Refurbishment Phase. Also, the CW intake flow will return to existing levels during the Continued Operation Phase. Table 8.2-1 indicates that with the continued operation of PNGS B, there will continue to be a loss of aquatic biota due to impingement and entrainment. However, there were no predicted population level effects due to either the Refurbishment or Continued Operation Phases of the Project (Section 5.6).

The effects of impingement and entrainment are generally limited to the Site Study Area with some recruitment from the Regional and Local Study Areas likely to occur; therefore, there is likely only minimal, if any, spatial interaction with DNGS or any of the reasonably foreseeable projects or activities identified at the DN site. Consequently, no cumulative effect will likely occur with any of the projects identified in Table 8.3-2. No mitigation measures beyond those identified in Section 5.6 are warranted or required. No further consideration of cumulative loss of aquatic biota due to impingement and entrainment, with respect to cumulative effects is warranted.

8.6 HYDROGEOLOGICAL EFFECTS

Table 8.2-1 identified a possible residual effect related to the release of tritium to groundwater at the PNGS B site. Section 5.8 discusses this issue.

The tritium in groundwater effects are limited to the Site Study Area, within the footprint of the PNGS B buildings. Therefore there is no spatial interaction with DNGS or any of the reasonably foreseeable projects or activities identified at the DNGS, and consequently no cumulative effect with any of the projects identified in Table 8.3-2. No mitigation measures beyond those

identified in Section 5.8.2 are warranted or required. No further consideration of tritium in groundwater with respect to cumulative effects is warranted.

8.7 TRANSPORTATION EFFECTS

Table 8.2-1 identified a possible residual effect related to traffic at local intersections during the Refurbishment Phase of the Project. Section 5.10 indicates that intersections at Highway 401 and Brock Road, and Bayley and Brock Road, are currently at or near capacity. With the increasing population in the region, the level of service at these intersections is expected to deteriorate. Additional traffic due to contract workers during the Refurbishment Phase may result in some further deterioration of these intersections. However, as noted in Section 5.10 and in the TSD for Transportation, the additional traffic from construction crews will likely result in only a minimal overall impact. The only exception is the intersection of Brock Road at Montgomery Park Road where the majority of additional construction-related traffic will pass through; however, it is deemed acceptable since this is the intersection with the best level of operation. Conditions will continue to be congested and delayed unless supplemental measures are implemented as described in the Region of Durham's Transportation Master Plan.

Figure 8.3-1 indicates that there are several other projects which may result in additional traffic during the Refurbishment Phase of the PNGS B Project, including:

- DNGS retubing;
- Construction of New Nuclear Generating Station at DNGS;
- Highway 407 completion;
- Brock Road Expansion;
- Pickering Airport; and,
- Growth in Regional Population and Economic Base.

A positive effect of 407 completion would be a reduction in flow of southbound traffic on Brock Road accessing Highway 401 eastbound.

A bounding scenario for growth in Regional Population and Economic Base (2.2% per year) has already been considered in the traffic analysis. It is this projected growth that is largely responsible for the predicted decrease in level of service at the local intersections. It should be noted that most of the population growth will take place north of Highway 401. This results in a very conservative assessment of traffic levels at local intersections. Transportation plans

developed in the future and required improvements to the transportation network will consider population growth. For example, the completion of Highway 407 is one such initiative.

The other projects identified are unlikely to have any spatial interaction with the PNGS B Refurbishment Phase traffic, as they are located either north of Highway 401, or east of Brock Road. Therefore, no further consideration of cumulative traffic during refurbishment activities is warranted.

8.8 RADIATION AND RADIOACTIVITY EFFECTS

Other than the radiation doses to NEWs during the Refurbishment Phase, the anticipated radiation doses from the Refurbishment Phase and Continued Operation Phase are within or comparable to baseline doses for workers (NEWs during Continued Operation and non-NEWs for both Refurbishment and Continued Operation), members of the public and non-human biota. The cumulative effects assessment includes these doses in combination with the contribution from the other projects and activities in the study area with potential for radiological effects (Table 8.3-2).

8.8.1 Type of Effect

A determination was made regarding whether or not the other projects and activities identified in Table 8.3-2 are likely to result in contributions to radiation doses to humans (i.e., doses to members of the public and workers) and non-human biota under normal operating conditions. Those projects and activities that were identified as potential sources of additional radiation and radioactivity into the environment that may contribute to radiological doses to humans and non-human biota, were the focus of the cumulative effects assessment.

Radiation doses to members of the public, workers and non-human biota are provided in Section 5.9 and the TSD for Radiation and Radioactivity using measurements and/or estimates of radiation and radioactivity in the existing environment in the vicinity of the PNGS B Project. Only radionuclides of the type released from nuclear facilities are used to estimate the doses (i.e., doses from background levels of naturally occurring radionuclides are excluded) for cumulative effects assessment. The levels of radiation and radioactivity measured in the environment near the PNGS B Project implicitly include contributions arising from the releases of radiation and radioactivity from all existing licensed nuclear facilities in the Regional Study Area. Therefore, radiation doses estimated from information on the existing environment automatically, albeit implicitly, include the cumulative doses from the past and existing projects and activities listed in Table 8.3-2.

8.8.2 Temporal Overlap

Since the PNGS B Project will occur within the same timeframe as all of the projects listed on Table 8.3-2 that are potential sources of additional radiation and radioactivity, there is a temporal overlap of the Project with each of these other projects. For this reason, the “radiological” projects identified in Table 8.3-2 are carried forward for further assessment.

8.8.3 Spatial Overlap

To determine the potential spatial overlap of the projects and activities considered in this cumulative effects assessment, it is necessary to consider the extent of radiation and radioactivity released by the PNGS B Project, and how that relates to the other projects and activities.

8.8.3.1 PNGS B Project

The spatial extent of the likely measurable effects of the PNGS B Project on human health and non-human biota is described in this sub-section. The extent of the effects is evaluated in relation to the radiation dose to members of the public, workers, and non-human biota.

Members of the Public

The expected annual dose to the members of the public living, working or recreating near the PN site from the PNGS B Project is estimated to be $< 10 \mu\text{Sv/y}$ (see Section 5.9.6). These doses are very small. For example, the ACRP/ACNS (1990) suggested that an individual dose rate of $< 10 \mu\text{Sv/y}$ represents a “risk level that would generally be regarded as negligible in comparison with other risks”. Since the doses to a maximally exposed critical receptor who lives or works close to PN are very small, doses to people living or working more distant from the PN site will be even smaller. Therefore, the spatial extent of the effects of the proposed PNGS B Project on members of the public is expected to be limited to the PN exclusion zone. Consequently, projects and activities that contribute to radiation doses on the PN site have a spatial overlap with PNGS B.

Workers

Workers on the PN property include PNGS A workers (NEWs), PWMF workers (NEWs), and other workers on the PN site (NEWs and non-NEWs). The spatial extent of the annual dose to PN workers is necessarily limited to the PN exclusion zone. Consequently, all projects and activities that contribute to radiation doses on the PN site have a spatial overlap with PNGS B.

Non-human Biota

Similarly, as referred to in Sections 5.9.2 and 5.9.3 and as described in the Ecological Risk Assessment TSD, doses to non-human biota living on the site are small; therefore, the spatial extent of the effects on non-human biota is also considered to be the PN perimeter fence. Consequently, all projects and activities that contribute to radiation doses on the PN site have a spatial overlap with PNGS B

8.8.3.2 Other Projects and Activities

The furthest extent of the effects of the operation of the PNGS B Project on the radiation and radioactivity environment was determined to be the PN exclusion zone boundary. To assess the potential for spatial overlap of the effects of other projects and activities identified in Table 8.3-2, the spatial extents were estimated and compared to relevant guidelines.

As discussed above, radiation doses to humans that are $<10 \mu\text{Sv/y}$ are considered below regulatory concern and are not considered to overlap with doses from other sources. Doses to non-human biota that are within the variability of natural background levels are considered below concern and are not considered to overlap with doses from other sources.

Operation of the PNGS A and PWF I

OPG reports the cumulative annual emissions from the PN site (PNGS A, PNGS B and PWF I and II) (OPG 2006j) and the quarterly emissions from PNGS A and PNGS B. As discussed in Section 4.6, these quarterly emissions were used to calculate the baseline emissions for both PNGS A and PNGS B. As shown in Section 4.6, the baseline emissions for all radiological releases from PNGS A and PNGS B were less than 1.5% of the corresponding annual Derived Release Limit. Based on the detailed description of project works and activities in Sections 2.7 and 2.8, future radiological emissions for Refurbishment and Continued Operation of PNGS B are not expected to be substantially different from those currently released by PNGS B.

Operation of PWF II

The design of the DSC Storage Buildings provides sufficient shielding in the walls such that the gamma radiation levels at the perimeter fence of the PWF II site is predicted to be less than $0.5 \mu\text{Sv/h}$, which corresponds to a dose rate of $\leq 1000 \mu\text{Sv/y}$ for 2000 h/y occupancy, the CNSC public dose limit (for non-NEWs). The effect of the gamma radiation from the Storage Buildings on the terrestrial environment at the perimeter fence of the PWF II site is expected to be less than approximately $0.5 \mu\text{Gy/h}$ (see Section 5.9.2).

Operation of the Darlington Nuclear Generating Station (DNGS)

The PNGS B Project is approximately 28 km from the DNGS. The dose rate to the most exposed critical receptor groups (in 2005) near the DNGS site was reported at 0.9 $\mu\text{Sv/y}$ (OPG 2006j). Since doses from DNGS operations decrease with increasing distance from the DNGS site, the contribution of DNGS at the PNGS boundary is expected to be more than 100 times smaller (i.e., $< 0.01 \mu\text{Sv/y}$). At the mid-point between DNGS and PNGS, doses are expected to be smaller than at either of the site boundaries. Thus, the contribution of DNGS to dose at PNGS B is a very small fraction of the CNSC regulatory limit of 1,000 $\mu\text{Sv/y}$, and well below 10 $\mu\text{Sv/y}$, a level recommended by the ACRP/ACNS as below regulatory concern. Therefore, the spatial extent of the effects (annual dose) on members of the public from the operation of the DNGS is not expected to overlap the effects of the PNGS B Project. Corresponding overlap of doses to workers and to non-human biota are also not expected.

Operation of Darlington Waste Management Facility (DWMF)

Similar to the operation of the DNGS, the doses arising from the future operation of the waste management facility at DNGS are not expected to overlap with the effects of the PNGS B project.

PNGS A, PVMF I and PVMF II Decommissioning

The decommissioning process will be accompanied by a staged reduction of materials and radioactivity at the site. Accordingly, a staged reduction in emissions and exposures to workers, the public and the environment is also expected. The radiological effects will be well below applicable CNSC regulatory limits. Furthermore, they are expected to be less than the effects associated with operation and maintenance of the generating stations and PVMF, as set out in the above estimate. Hence, any potential cumulative effect is expected to be small and of no consequence.

Other Projects and Activities on the DN Property

In addition to the two Darlington projects and activities described above, the projects and activities in the following list also occur on the DN property about 28 km from the PNGS B Project. Similar to the operation of DNGS, these three activities are not likely to have a spatial overlap with the effects of the Project:

- DNGS - re-tubing and storage of re-tube components;
- DNGS - shutdown and decommissioning; and
- DWMF - shutdown and decommissioning.

As discussed above for PNGS operations, the radiological effects of DNGS re-tubing, shutdown and decommissioning operations, and DWMF shutdown and decommissioning are expected to be less than the existing effects associated with operation and maintenance of these facilities.

Therefore, the spatial extent of the effects (annual dose) on members of the public from these projects on the DN property are not expected to overlap the effects of the PNGS B Project. Corresponding overlap of doses to workers and to non-human biota are also not expected.

Operation of New Nuclear Generating Station at Darlington Site

At the present time, the type and capacity of the additional new reactors that would be proposed for use at the DN site are unknown. However, it is likely that the dose rate to the maximally exposed critical receptor group near the DN site would remain below 10 $\mu\text{Sv/y}$ (a level considered below regulatory concern) even if the existing reactors continued operating. The spatial extent of the effects (annual dose) on members of the public from the operation of the new nuclear generating units at the DN site is not expected to overlap the effects of the PNGS B Project. Corresponding overlap of doses to workers and to non-human biota are also not expected.

Non-OPG Facilities and Activities Licensed by CNSC

Non-OPG facilities and activities licensed by the CNSC also operate in the Local and Regional Study Areas. Each operator must ensure that radiation doses to members of the public are less than regulatory levels at the boundary of the licensed properties. OPG's radiation environmental monitoring program clearly demonstrates that radiation and radioactivity levels at the PN exclusion boundary are mainly attributable to natural background with a very small contribution from licensed activities on the PN site, and that no other facilities contribute measurable radiation or radioactivity levels. Therefore, the spatial extent of the effects of the non-OPG facilities and activities licensed by the CNSC are not expected to overlap the area affected by the PNGS B Project.

8.8.4 Summary of Likely Interactions of Effects

Based on the assessments described above, the projects that remain under consideration are those current and future projects that are likely to occur during the same time and in the same geographic area (i.e., space) as the effects of the PNGS B Project. Where there is a likely overlap in effect (●), time (✓) and space (■), there is a potential for a cumulative effect; therefore, an assessment of these likely cumulative effects is warranted as identified in Table 8.4-1.

Radiation doses to members of the public, workers and non-human biota are estimated in Sections 5.9.6, 5.9.5, 5.8.3 and 5.9.2 and in the TSD for Radiation and Radioactivity, using estimates and/or measurements of radiation and radioactivity in the existing environment in the vicinity of the PNGS B Project. Only radionuclides of the type released from nuclear facilities are used to estimate the doses (i.e., doses from background levels of naturally occurring radionuclides are excluded). The radioactivity in the environment near the Project represents releases from all existing licensed nuclear facilities in the Regional Study Area. Therefore, radiation doses estimated from the existing environment implicitly include the cumulative doses from the past and existing projects and activities listed in Table 8.4-1.

**TABLE 8.4-1
LIKELY INTERACTION OF RADIATION AND RADIOACTIVITY EFFECTS**

Projects and Activities	Radiation and Radioactivity			
	Doses to Members of the Public	Doses to Nuclear Energy Workers	Doses to Non-Nuclear Energy Workers	Doses to Non-Human Biota
<i>Past and Existing Projects and Activities</i>				
PNGS A Operations	● √ ■	● √ ■	● √ ■	● √ ■
DNGS Operations	● √	● √	● √	● √
PWMF I Operation	● √ ■	● √ ■	● √ ■	● √ ■
Other CNSC Licensed Facilities	● √	● √	● √	● √
<i>Certain/Planned or Reasonably Foreseeable Projects and Activities</i>				
PWMF I Decommissioning	● √ ■	● √ ■	● √ ■	● √ ■
PWMF II Operation and Decommissioning	● √ ■	● √ ■	● √ ■	● √ ■
DWMF Operation and Decommissioning	● √	● √	● √	● √
PNGS A Decommissioning	● √ ■	● √ ■	● √ ■	● √ ■
DNGS Re-tubing	● √	● √	● √	● √
DNGS Decommissioning	● √	● √	● √	● √
Construction of New Nuclear Generating Station at DNGS	● √	● √	● √	● √

- Effects are similar to those of the PNGS B Project or may combine to result in an adverse effect on a VEC.
- √ Likely temporal overlap with the PNGS B Project.
- Likely spatial overlap with the PNGS Project.

8.8.5 Cumulative Radiation Doses

This section describes the cumulative radiation doses to members of the public, nuclear energy workers (NEWS), non-nuclear energy workers (non-NEWS), and non-human biota from the projects and activities remaining under consideration (i.e., those with effects that have both a spatial and temporal overlap with the effects of the PNGS B Project as indicated in Table 8.4-1):

- PNGS A Operations;
- PWMF I;
- PWMF II;
- PWMF Shutdown/Decommissioning; and
- PNGS A Shutdown/Decommissioning.

The following sections provide estimates of the dose to members of the public, PWMF II workers, and non-human biota.

8.8.5.1 Members of the Public

Dose Levels

The assessment of cumulative radiation doses to members of the public living and working near PN from gamma radiation from the proposed PNGS B Project, and from present and future licensed radiation and radioactivity sources, was conducted assuming a maximally exposed hypothetical critical receptor who lived or worked in close proximity to the PN site. The cumulative radiation dose is expected to be a small fraction of the CNSC regulatory limit and a small fraction of the temporal and spatial variability in background radiation levels.

People living, working and participating in recreational activities in regions between the PN and DN sites may be exposed to radioactivity releases and radiation emitted from licensed activities on both sites. However, the magnitudes of the cumulative doses to them are expected to be small fractions of the estimated doses to hypothetical individuals at the PN property boundary as described below.

The airborne concentrations of radioactivity and the radiation levels from licensed activities that contribute to the radiation doses to the hypothetical individual and to non-human biota at the PN property boundary decrease with increasing distance from the site due to natural environmental phenomena, such as atmospheric dispersion and absorption of radiation. Therefore, radiation doses also decrease with increasing distance. Airborne concentrations of radioactivity and the radiation levels from licensed activities at the DN site, and corresponding doses, also decrease with increasing distance from that site. The cumulative doses to humans living between the PN and DN sites are attributable to sources of radiation and radioactivity at both sites, but the highest sums of doses are expected to occur at the respective property boundaries and are almost entirely from the immediately adjacent facility.

Identified Mitigation Measures

The estimated cumulative doses to the most exposed members of the public are expected to be small fractions of the CNSC regulatory limits, within the variability of natural background dose, and of no significance. Therefore, no mitigation measures are warranted.

Residual Cumulative Effects

No residual cumulative adverse effects of doses to members of the public are anticipated.

8.8.5.2 Workers on the PN Property

Dose Levels

PN Workers (NEWs)

Before work in areas of potential radiation exposure is carried out, OPG conducts radiation surveys to evaluate the potential for worker exposures, and plans activities and the use of protective equipment. These preparations are undertaken with the objectives of maintaining doses (i) below CNSC regulatory limits, (ii) below OPG's ECLs, and (iii) as low as reasonably achievable, social and economic factors taken into consideration (ALARA). OPG's ECL on effective dose is < 10 mSv/y. During potential work exposures, workers are monitored to ensure that the objectives are met. From the time a pregnant worker declares her pregnancy, the dose received throughout the remainder of her pregnancy is limited to 4 mSv (CNSC 2000).

The dose contributions from operations at the PNGS A, PNGS B and PWMF, plus PNGS B refurbishment and continued operation, and ultimately from the PNGS A and PNGS B and PWMF shutdown/decommissioning projects, will be included in the occupational dose measurements when those activities occur. The dose planning and monitoring program at the PNGS B will implicitly incorporate the dose contributions from all licensed activities.

The annual doses to NEWs at PN are well below regulatory limits of 50 mSv per one-year dosimetry period, and 100 mSv per five-year dosimetry period (i.e. an average of 20 mSv in a one-year dosimetry period). In addition, doses will be controlled to ALARA using OPG's dose control limits, such as the ADL and ECL.

However, as indicated in Section 5.6, the collective dose to workers (NEWs) carrying out refurbishment activities are expected to be higher than those associated with normal operation, after taking account of mitigation.

PN Workers - Non-NEWs

The planning for and refurbishment of PNGS B will ensure that the cumulative dose to non-NEWs is maintained below the CNSC dose limit for a member of the public of 1000 $\mu\text{Sv/y}$.

Identified Mitigation Measures

The estimated cumulative doses to NEWs and non-NEWs are expected to be less than CNSC regulatory limits; the doses to NEWs during continued operation and to non-NEWs during both refurbishment and continued operation are expected to be similar to baseline conditions. Therefore, no mitigation measures during continued operation are warranted or required. However, doses to NEWs carrying out refurbishment activities are expected to be higher than those during normal operation. A range of mitigation measures is being considered to reduce worker dose in the Site Study Area, such as reduction of source term radiation fields, remote tooling, shielding, and primary system decontamination. Specific measures to be implemented will be determined during the detailed engineering work.

Residual Cumulative Effects

No measurable residual effect of doses to workers is anticipated other than for NEWs who carry out refurbishment activities. In all cases, doses will be maintained below regulatory limits. Nonetheless, collective dose to workers (NEWs) carrying out refurbishment activities is identified as a residual effect and is forwarded to Chapter 9.0 for a determination of significance.

8.8.5.3 Cumulative Dose to Non-Human Biota***Dose Levels***

As described in Section 5.9.2 and 5.9.3 and in the Ecological Risk Assessment TSD, the anticipated doses to non-human biota are anticipated to be a small fraction of reference dose levels established by UNSCEAR (1996). Thus no effects to non-human biota are expected.

Identified Mitigation Measures

The estimated cumulative dose to non-human biota is expected to be much less than the no-effects levels reported by UNSCEAR; therefore, no mitigation measures are warranted or required.

Residual Cumulative Effects

No measurable residual cumulative effects on doses to non-human biota are anticipated.

8.9 SOCIO-ECONOMIC EFFECTS

8.9.1 Type of Effect

The socio-economic assessment concluded that four residual adverse effects on Socio-economic Conditions are likely as a result of the Project. The residual adverse effects and associated VECs are identified in Table 8.3-2.

Each of the certain/planned and reasonably foreseeable projects and activities identified in Table 8.3-2 will contribute to changes to the regional labour market. Projects and activities that have the potential to generate nuisance effects and additional traffic will likely contribute to Reduced Use and Enjoyment of Community and Recreational Features, and the Reduced Use and Enjoyment of Property. Any new project on the PN site has the potential to result in a change in public attitudes among residents from across the Regional Study Area. With the exception of recreational fishing, all of the existing and planned project works and activities involve operations that generate nuisance effects and increased traffic, or have construction components that will generate nuisance effects and traffic.

8.9.2 Temporal Overlap

To determine the potential temporal overlap of all the projects and activities considered in this cumulative effects assessment, it is necessary to consider the timing or duration of the socio-economic effects of PNGS B Project, and how they relate to the other projects and activities.

As all residual adverse effects of the Project are anticipated to occur during the Refurbishment Phase, the effects of other projects and activities that are likely to occur between approximately 2010 and 2024 will overlap with the effects of the Project. All other projects and activities have the potential for a temporal overlap with the effects of the PNGS B Project. However, the additional involvement of local fire, police and related services resulting from all other project works and activities was not considered likely to overlap with those of the PNGS B Project. This is because such community service requirements (e.g., fire and security inspections, traffic control, training) are typically either one-time events (e.g., traffic control), very short-term in nature (e.g., fire and security inspections) or can be readily accommodated within community service delivery schedules. As such, the likelihood that they would occur simultaneously at a magnitude that a service delivery would measurably be affected is considered remote.

8.9.3 Spatial Overlap

To determine the potential spatial overlap of all the projects and activities considered in this cumulative effects assessment, it is necessary to consider the geographic extent of the socio-economic effects of PNGS B Project, and how that relates to the other projects and activities.

Pickering B Refurbishment and Contined Operation Project

As defined in Section 5.11 and the Socio-economic Conditions TSD, the spatial extent of the likely measurable effects of the PNGS B Project are summarized in Table 8.9-1.

**TABLE 8.9-1
GEOGRAPHIC EXTENT OF RESIDUAL ADVERSE EFFECTS ON SOCIO-ECONOMIC CONDITIONS**

Residual Adverse Effect	VEC	Geographic Extent
Changes to Regional Labour Market	Employment	Effect is likely to be widespread across the Local and Regional Study Areas and beyond
Reduced Use and Enjoyment of Community and Recreational Features	Recreational and Community Features / Resource Use	Effect is likely to be noticeable to a few Waterfront Trail users and Regional Study Area residents who change their attitudes as a result of the Project.
Additional Involvement of Local Fire, Police and Related Services	Health and Safety Facilities and Services	Effect is likely to be noticeable to some community service workers operating in the Local Study Area
Reduced Use and Enjoyment of Property	Use and Enjoyment of Property	Effect is likely to be noticeable at a few residential locations within the Local Study Area (i.e., along Sandy Beach Road)

Other Projects and Activities

Several of the other projects and activities identified in Table 8.2-1 will contribute to changes to the regional labour market. Each of the projects that has a construction component will likely draw from the regional labour pool and beyond. Similarly, each of these projects will also likely place demands on local and regional community service providers.

Only those projects and activities that occur within the Local Study Area and areas of future growth in regional population and economic base are likely to contribute to Reduced Use and Enjoyment of Community and Recreational Features, and to Reduced Use and Enjoyment of Property. These projects and activities have the potential to generate nuisance effects and additional traffic on roads nearest the PN site that might affect the community and recreational features nearest the PN site (e.g., Waterfront Trail) and residences along access roads to the PN site (e.g., Sandy Beach Road). Any new

project on the PN site has the potential to result in a change in public attitudes among residents from across the Regional Study Area.

8.9.4 Summary of Likely Interactions of Effects

Based on the assessments described above, the projects that remain under consideration are those current and future projects that are likely to occur during the same time and in the same geographic area (i.e., space) as the effects of the PNGS B Project. Where there is a likely overlap in effect (●), time (✓) and space (■), there is a potential for a cumulative effect; therefore, an assessment of these likely cumulative effects is warranted as identified in Table 8.9-2.

**TABLE 8.9-2
SUMMARY OF LIKELY INTERACTIONS WITH RESIDUAL ADVERSE
EFFECTS ON SOCIO-ECONOMIC CONDITIONS**

Projects and Activities	Residual Adverse Effects on Socio-economic Conditions			
	Changes to Regional Labour Market	Reduced Use and Enjoyment of Community and Recreational Features	Additional Involvement of Local Fire, Police and Related Services	Reduced Use and Enjoyment of Property
<i>Past and Existing Projects and Activities</i>				
PNGS A Operations	✓■	●✓■	■	●✓■
DNGS Operations	✓■	●✓	■	●✓
PWMF I Operations	✓■	●✓■	■	●✓■
Recreational Fishing	✓	✓■		✓■
Non-OPG Facilities Licensed by CNSC	✓■	●✓	■	●✓
<i>Certain/Planned or Reasonably Foreseeable Projects and Activities</i>				
PWMF II Operation and Decommissioning	●✓■	●✓■	●■	●✓■
DWMF Operation and Decommissioning	●✓■	●✓	●■	●✓
PWMF I Decommissioning	●✓■	●✓■	●■	●✓■
Expansion of Duffin Creek WPCP	●✓■	●✓■	●■	●✓■
PNGS A Decommissioning	●✓■	●✓■	●■	●✓■
DNGS Re-tubing	●✓■	●✓	●■	●✓
DNGS Decommissioning	●✓■	●✓	●■	●✓
Construction of New Nuclear Generating Station at DNGS	●✓■	●✓	●■	●✓
Highway 407 East Completion	●✓■	●✓	●■	●✓
Brock Road Expansion	●✓■	●✓	●■	●✓
Active Development Proposals in the Vicinity of PNGS	●✓■	●✓■	●■	●✓■
Pickering Airport	●✓■	●✓	●■	●✓
Growth in Regional Population and Economic Base	●✓■	●✓■	●■	●✓■

- Effects are similar to those of the PNGS B Project or may combine to result in an adverse effect on a VEC.
- ✓ Likely temporal overlap with the PNGS B Project.
- Likely spatial overlap with the PNGS B Project.

8.9.5 Cumulative Effects

8.9.5.1 Changes to Regional Labour Market

Each of the certain/planned and reasonably foreseeable projects and activities will contribute to changes to the regional labour market. Of all the other projects that are likely to increase competition for construction labour, the major construction projects on the Darlington Nuclear site (i.e., retubing, new nuclear generating station) and the Pickering Airport Project have the greatest potential to generate changes to the regional labour market. These projects are likely to have workforce requirements equal to or greater than the PNGS B Project (i.e., several thousand workers).

Ontario's construction sector currently employs over 400,000 workers and it is anticipated that the construction work force in Ontario will grow by approximately 1% per year (i.e., over 4,000 workers per year). As such, each of these major and long-term construction projects has the potential to consume a substantial portion of one year's anticipated annual growth (in employment in the construction sector across Ontario). They will likely place a sustained demand on the regional and provincial construction labour force. Therefore, there exists the possibility that the competition generated by these major and longer term construction projects occurring simultaneously or in sequence could result in sustained shortages of workers, force contractors to delay project delivery time schedules or scale back their activities as has been experienced in the recent past (CSC 2006).

Mitigation Measures

The ability to meet the sustained demand on the regional and provincial construction labour force will determine whether or not changes to the regional labour market will generate such adverse cumulative effects as noted above. This will depend largely on the type and level of construction activity across Canada, and patterns of internal migration of construction workers. Planned increased recruitment and training efforts on the part of the construction sector may serve to reduce the magnitude of these effects towards the end of the Refurbishment Phase and beyond. No mitigation is recommended to minimize the potential effects as these effects are beyond OPG's direct control. Moreover, it remains uncertain whether such cumulative effects will materialize.

Residual Cumulative Effect

Sustained shortages of workers, potentially resulting in delays of project delivery time schedules or the scaling back of construction activities elsewhere in the Durham Region is considered an adverse residual cumulative effect and has been forwarded to Chapter 9.0 for a determination of significance.

8.9.5.2 Reduced Use and Enjoyment of Property and Community and Recreational Features

Refurbishment Phase

Projects and activities that have the potential to generate nuisance effects and additional traffic will likely contribute to reduced use and enjoyment of property and reduced use and enjoyment of community and recreational features. Several of the projects identified in Table 8.9-2 - PWSMF II, Active Development Proposals in the Vicinity of PNGS, and Growth in Regional Population and Economic Base - may generate some limited residential intensification in the vicinity of PNGS but are considered to have limited potential to generate noticeable nuisance effects along the Waterfront Trail nearest the PN site or at residential locations along Sandy Beach Road. These projects are not likely to result in a measurable change in the use and enjoyment of property or community and recreational features on their own. Furthermore, because these projects are relatively short term in comparison to the PNGS B Project, a measurable cumulative effect is not considered likely. It is more likely that any effects would be masked by those of the PNGS B Project.

The expansion of the Duffin Creek WPCP is not likely to add construction traffic along Sandy Beach Road, but may result in other nuisance effects that may affect users of the Waterfront Trail near the PN site. At present, the Regions of Durham and York (i.e., the project proponents) anticipate that Montgomery Park Road will be the main construction access to the site, with potential construction staging/storage areas along the road. However, consideration is being given to using Jodrel Road as the main construction access route (Durham Region et. al. 2006).

The final Environmental Study Report (Durham Region et. al. 2006) for this expansion project indicates that fencing/hoarding for the duration of construction of the expansion will likely be at the WPCP property boundary. Effects of construction will include vibration, noise, dust, lights, considerable truck and motorized heavy equipment traffic, and reduced and/or blocked access along Jodrel Road and Montgomery Park Road, particularly the portion of Montgomery Park Road between Duffins Creek and the Duffin Creek WPCP (i.e., east side).

Finally, the expansion project may require the temporary closure of the Waterfront Trail and the Trail's realignment near the WPCP property. It is expected that efforts will be made to maximize the recreational value of the Trail through screening of plant activities and by locating it closer to the Lake. Closures of the Waterfront Trail will be minimized by realigning it prior to the commencement of construction. These activities are expected to be short term and would occur early in the construction phase of the expansion project; therefore, they are not likely to coincide with the effects of the PNGS B Project.

Nevertheless, users of the Waterfront Trail will experience additional disruption to their activities for an extended length of the Waterfront Trail (i.e., from approximately Montgomery Park Road / Sandy Beach Road intersection to east of the existing WPCP). Further reductions in the use and enjoyment of the Waterfront Trail in this area can be expected for the four-to-five year construction period associated with the expansion project. The combined effect of these two projects will serve to make this area of the Trail less attractive during the WPCP construction period. Trail users may avoid this area altogether during this period.

Continued Operation Phase

Any project or activity on the PN site has the potential to result in an adverse change in public attitudes among residents from across the Regional Study Area. Should these activities result in substantial decreases in residents' satisfaction with community or their sense of health, safety and well-being, further reductions in the use and enjoyment of property and community and recreational features are likely.

The continued safe operation of PNGS A and the PWF I are not expected to result in adverse changes in peoples attitudes that would be of sufficient magnitude to change their behaviours. This has been demonstrated through public attitude research since 1999 that indicates that ongoing operations have not adversely affected people's attitudes. Monitoring of public attitudes over the past seven years indicates that the PN site is much less of an issue among residents living in the Regional Study Area than in the past. Similar trends are evident in the neighbourhoods nearest the station and for the municipality of Pickering as a whole.

Based on previous and current public attitude research conducted in the vicinity of the PNGS, there are no indications that the decreased levels of satisfaction evident in the Regional Study Area since 1999 can be attributed solely to the presence of the station. They are clearly the result of increased growth, urbanization and related social consequences (e.g., crime, problems with youth, traffic and congestion, etc.) within the Regional Study Area.

Changes in public attitudes from the ongoing storage of used fuel on the PN site (i.e., within the stations and at PVMF) are not expected, provided that the PNGS B continues to operate. The storage activity is viewed by local residents as an interim activity and an ongoing part of station operations. Furthermore, new projects and activities are not altogether unfamiliar to study area residents (i.e., storage of used fuel, construction and demolition of on-site buildings). Finally, the EA study completed for the PVMF II project determined that there are no likely adverse environmental effects of the PVMF II project on socio-economic conditions. As such, cumulative effects are not likely.

Ongoing operations at the PN site includes off-site transportation of low and intermediate level (operational) radioactive wastes to OPG's Western Waste Management Facility at the Bruce site. It is anticipated that the off-site transportation of used nuclear fuel and other radioactive wastes that may occur during the latter part of the Continued Operation Phase of the PNGS B Project, after a long-term waste management facility becomes available, has the greatest potential to generate a change in attitude among residents. However, it remains uncertain whether such changes would be adverse in nature or of sufficient magnitude that people would change their behaviours to a measurable extent. It is possible that the off-site transportation of used fuel, other nuclear materials and the decommissioning of waste storage facilities on site may serve to demonstrate that the PN site is not a long-term waste management site and may thus be seen positively. Conversely, the transportation activities themselves may be seen as posing an additional risk. As such, further reductions in the use and enjoyment of community and recreational features near the PN site during the latter part of the Continued Operation Phase are difficult to predict at this time.

The final EA Study Report (Durham Region et. al., 2006) for the WPCP expansion project indicates that during operation, taking into account the implementation of mitigation, no significant off-site noise, dust or odour effects are anticipated. The additional trucks entering the site would not likely use Montgomery Park Road. It is expected that the expanded WPCP may affect the recreational value of the Waterfront Trail through visual effects of the plant. However, a berm will be constructed to screen the view of the plant from the Waterfront Trail. Furthermore, the EA study recognizes that opportunities exist to enhance the experience of Waterfront Trail users as they pass the WPCP along the waterfront; discussions between the Regions, the TRCA and the City of Pickering will continue in this regard. As such, a measurable cumulative effect of the expanded plant operation with that of the PNGS B Project is not anticipated. Any enhancements to the Trail will serve to minimize or offset any direct effects of the PNGS B Project on use and enjoyment of the Waterfront Trail.

Mitigation Measures

To address the likely reduced use and enjoyment of the Waterfront Trail by Trail users resulting from the PNGS B Project and the WPCP expansion project, OPG will confirm the appropriate signage and/or pavement markings near the PN site to reduce the potential for disruption to and ensure safety of Waterfront Trail users.

In addition, OPG will review with City of Pickering officials that traffic management and parking can safely accommodate the workforce during the Refurbishment Phase. A Parking Management Plan for temporary parking during the Refurbishment Phase may be developed as a contingency.

Residual Cumulative Effect

Further reductions in the use and enjoyment of the Waterfront Trail during the Refurbishment Phase over a four-to-five year construction period associated with the WPCP expansion project is considered a residual adverse cumulative effect. The combined effect of the two projects will serve to make portions of the Trail less attractive, likely resulting in Trail users avoiding portions of the Trail altogether during this construction period.

Further reductions in the use and enjoyment of community and recreational features near the PN site during the Continued Operation Phase may occur due to adverse changes in public attitudes associated with eventual off-site transportation of used fuel and other nuclear materials.

These residual adverse cumulative effects have been forwarded to Chapter 9.0 for a determination of significance.