ONTARIO POWER GENERATION

The Niagara Tunnel Project

Project Execution Plan

Hatch Mott MacDonald
in association with HATCH ACRES

March 27, 2006

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Revision History

No.	Date	Summary of Revisions	By
Initial Draft	August 12,2004	In progress issue for information and additional content input	HC
Second Draft	September 16, 2004		HC
Third Draft	February 16, 2005	Content added for review and input by project team prior to PEP/ Team Building Workshop	HC
Fourth Draft	February 27, 2005	Input from project team incorporated for discussion at PEP workshop	HC
Fifth Draft	March 30, 2005	Incorporation of team comments following PEP workshop	HC
Sixth Draft	April 8, 2005	Incorporation of additional team comments. Issued for approval	HC
Seventh Draft	March 27, 2006	Incorporation of Phase 2 activities	HC

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Note: This edition of the Project Execution Plan
includes revisions applicable to Phase 2 of the Project

Approvals

Title	Signature	Date
Owner's Representative Project Manager		March 27/06
OPG Project Director		March 24/06
OPG Project Sponsor		March 27/06

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Project Execution Plan

Project Team acknowledgement of participation in preparation of the Project Execution Plan

Name	Signature	Date
Brignal, Norm		
Charalambu, Harry		April 12/05
Da Silva, Neville		April 13th/05
Davis, Mike		April 13/05
Del Frari, Mark		April 13/05
Delmar, Russel		April 12/05.
Eden, David		
Elsayed, Emad	Emad Elsayed	April 12, 2005
Erzetic, Josie	Josie Erzetic	Apr. 13.05
Everdell, Rick		April 12, 2005
Gherbaz, Sabrina		April 12, 2005
Hammond, Kath	Kath Hammond	April 12, 2005
Heath, Dave	Dave Heath	April 15, 2005
Hughes, Michael		April 12, 2005.
Judge, David		April 14 2005
Mee, Cate		April 13 2005
Monteith, Stephanie	Stephanie Monteith.	April 12, 2005
Over, Ed	Ed Over	April 12, 2005
Rigbey, Stephen		April 14/05
Symmonds, Phil		April 12, 2105
Tait, John		April 12, 2005
Walker, Chris		13 April 2005
Walsh, Mary Anna		April 12, 2005.
Wong, Richard		April 13/05

The Niagara Tunnel Project

Project Execution Plan

Phase 2 - Project Team acknowledgement of participation in preparation of the Project Execution Plan

Name	Signature	Date
Brignall, Norm		MARCH 28/06
Charalambu, Harry		March 28/06
Da Silva, Neville		March 28/06
Del Frari, Mark		Mar 28/06
Delmar, Russel		March 23/06
Downie, Murray		March 24/06
Elsayed, Emad		March 27/06
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Everdell, Rick		March 24, 2006
Gallina, David		March 24/6.
Hammond, Kath		March 28/06
Heath, Dave		March 24/6
Hughes, Michael		March 23, 2006
Mee, Cate		March 23/2006
Norton, Dean		Mar 24/06
Over, Ed		Mar 28/06
Tait, John		March 23 2006
Walker, Chris		31 March 2006
Walsh, Mary Anna		March 23, 2006
Wong, Richard		Mar 28/06
Zielinski, Andy		March 27, 2006

Table of Contents

1 Introduction and Background

Ontario Power Generation Inc. (**OPG**) is in the process of constructing a water diversion tunnel (the **Niagara Tunnel Project** or the **Project**) in Niagara Falls, Ontario. This tunnel is part of the Niagara River Hydroelectric Development (**NRHD**), planned by OPG in the 1980s and submitted for environmental assessment (**EA**) approval in 1991. EA approval for the entire undertaking, consisting of two diversion tunnels, a power plant and transmission facilities, was obtained October 14, 1998. Also in 1998, OPG obtained a number of bids from construction consortia for the design and construction of the diversion tunnel. OPG did not proceed with the project at that time. A Project Closeout Report was prepared in 1999 to document the procurement process and to identify actions to be taken in the event of Project reactivation.

OPG recently decided to proceed with construction of one diversion tunnel at this time. The Project was approved by OPG's Board of Director's on July 28, 2005, for a total cost of $985 million and completion targeted for late 2009. The full release includes provisions for work required at Ontario Power Generating Station and Toronto Power Generating Station under the Niagara Exchange Agreement and for work required to address historical Welland River issues.

The Project Charter, outlining the need and justification for the Project as well as Project objectives, deliverables, budget, management approach and the authority of the Project Director, is included as Appendix A of this document. The Project Charter has been signed by the Project Sponsor, the Project Director and the Manager of the Niagara Plant Group as the project customer.

A Memorandum of Understanding (the **MOU**) has been signed by the Niagara Plant Group and by the Project Team. This MOU, and associated protocols, elaborates on the relationship between the Niagara Plant Group and the Project Team, and clarifies the role of the Niagara Plant Group in the Project. The MOU is attached in Appendix C.

The Niagara Tunnel Facility Project (the Facility Project) refers to the Design/Build portion of the Project, specifically the diversion tunnel.

The Facility Project is being implemented in two distinct phases, namely,
- Phase 1 – Planning and Procurement Phase
- Phase 2 – Design/Construction and Commissioning Phase.

Phase 1 commenced in June 2004 and was completed at the end of August 2005 with the successful negotiation and award of the contract for design and construction for the Niagara Tunnel Facility Project to Strabag AG of Austria (Contractor). Phase 2 started on September 1, 2005, the contractual start date of the Niagara Tunnel Facility Project.

The purpose of this Project Execution Plan (the **PEP**) is to ensure that all key issues important to the success of the Project are identified, defined and understood at the earliest possible stage in development of the undertaking. The PEP also provides the Project team members, end users

and line authority with a common understanding of the Project and the planned method of execution.

Developed in consultation with the project team members, the PEP identifies project objectives, scope, responsibilities, strategies, constraints, processes and mechanisms to be employed in managing and controlling the Project. The PEP is intended to be a living document. It will be regularly reviewed and updated as necessary during the execution of the Project.

It is the responsibility of the Project Manager, provided by Owner's Representative ("**OR**") to facilitate development of and to maintain the PEP with the support, and in consultation with the project participants. Each section of the PEP is assigned to a section owner (see Appendix B) who will be responsible for collecting updates for that section for submission to the Project Manager.

Project execution will be periodically audited against the PEP by the Project Director, to ensure that the plan is being followed.

2 Purpose of Project and Objectives

2.1 Project Purpose

The new diversion tunnel is intended to facilitate more efficient utilization of available water in the existing Sir Adam Beck generating complex, increasing the average annual energy production by about 1.6 TWh. At an estimated Levelized Unit Energy Cost (LUEC) of approximately 4.8 ¢/kWh (2005 dollars), the Project provides a competitive alternative for meeting the needs of the Province.

2.2 Objectives

The objective of the Project is the successful design and construction of a diversion tunnel to divert at least an additional 500 m^3/s of flow from the upper Niagara River to the Sir Adam Beck generating complex, executed in a safe, environmentally responsible, economic and timely manner as described below and to the extent practical and possible, in a manner that reflects and meets the requirements of the primary stakeholders.

2.2.1 Safety

OPG considers safety as a primary objective with a Project goal to maintain a safe working environment that results in completion of the Project with zero fatalities, zero critical injuries, and zero lost time injuries while maintaining the safety of the public at all times. In OPG's "Owner Only" capacity on this project, the Contractor will be responsible for safety within its controlled areas. For Part Project Area (as described below) activities carried out at the International Control Works (INCW), however, OPG will assume the role of "Constructor" at which times the Contractor will execute the work in a manner that is consistent with OPG/NPG safety procedures and the OR will manage safety on OPG's behalf.

2.2.2 Environmental Protection

The Project is to be executed to meet the commitments contained in the Environmental Assessment (EA) and the conditions of the EA Approval, all legislated environmental and mitigation requirements and to provide at project completion, minimal long-term environmental obligations to the OPG Niagara Plant Group.

2.2.3 Quality

The Project is to achieve a high overall quality of design and construction and meet all specified performance requirements. It is intended that the design and construction of the project provide for a 90-year service life for key elements of the facility such as the tunnel, intake structure and outlet structure, and will not result in any forced outages during that period. Other components of the project will be designed and constructed to meet, at a minimum, existing legal requirements. The Design/Build Agreement requires the Contractor to demonstrate that the Guaranteed Flow Amount (GFA) of 500 m^3/s through the diversion tunnel has been achieved by conducting specified flow tests. Should the GFA not be met, the Contractor will be liable for liquated damages or if it is exceeded, a bonus will be available.

2.2.4 Cost and Schedule

The project is to be maintained on schedule and within the approved budget. Decisions regarding any deviation from approved budget and/or schedule will be based on the net business impact, considering the tradeoff between project cost and business revenue. Change control and dispute resolution boards will be established.

The budget for the Project has been approved by the OPG Board of Directors and the Provincial Government for $985 million for the total of Phases 1 and 2.

An in-service date of October 2009 has been established in the Design/Build contract.

2.2.5 Working Relationships

Priority will be given to maintaining good working relationships with stakeholders, contractors, and the affected public during planning and construction of the Project.

A key objective is to minimize Project impact on the ongoing operations of Niagara Plant Group. Measures of this objective include

- zero Treaty violations concerning Falls flow
- zero International Niagara Board of Control (INBC) Directive violations concerning Grass Island Pool (GIP) operation
- zero ice management incidents
- zero forced outages at existing diversion and generation facilities
- optimal planned outages coordinated with Niagara Plant Group outage plans
- maintenance of positive relationships with regulators and host communities
- maintenance of ISO 14001 registration by the Niagara Plant Group
- maintenance of BSA 18000 registration by the Niagara Plant Group.

Another key objective is to ensure sufficiently detailed reporting to the OPG Board of Directors and the Province of Ontario such that their confidence in OPG's ability to execute large projects is maintained.

3 Project Scope

The Facility Project includes the planning, design, construction, commissioning and placing into service of an approximately 10.4-km long diversion tunnel with an average 12.65-m internal diameter, including all associated facilities and enabling work. The tunnel will divert 500 m^3/s of the Niagara River flow from an intake located under the INCW structure, located upstream from Niagara Falls, to an outlet that will discharge into the existing canal system that feeds the existing Sir Adam Beck generating complex. The Project is being executed in two phases as follows:

Phase 1
This phase included project activation, project planning, conceptual design, certain permitting/approvals submissions, procurement and the execution of a Design/Build Agreement with Strabag AG. The planning and design of enabling work such as road improvements and utility connections was also part of this phase.

Key deliverables included Contractor prequalification, contractor selection, executed Design/Build Agreement, certain applicable permits/approvals and third party agreements, designs for enabling work, a Release Quality Estimate (RQE) and Business Case for Phase 2 and Project approval by OPG's Board of Directors.

Phase 2
This phase of the Facility Project includes obtaining the remaining applicable permits/approvals, detail design, construction, construction management, testing and commissioning of the diversion tunnel and construction and installation of enabling works.

Key deliverables include permits/approvals, detailed design and construction of the diversion tunnel and associated facilities, tunnel commissioning and placing into service, performance testing and project closeout including a closeout report.

The scope of the Project work is summarized and illustrated by the Work Breakdown Structure (WBS) in Exhibit 3.1. The WBS establishes a systematic, hierarchical approach for identification of all the work elements in the Project. The WBS for the Niagara Tunnel Project provides a logical breakdown of the work and retains flexibility to accommodate adjustments to the Project configuration.

3.1 Third Party Requirements

Third Party requirements include items that are not part of the Design/Build Agreement but are required to be implemented prior to, or during the course of, the Niagara Tunnel Project work. The majority of these requirements relate to meeting the commitments contained in the EA and the conditions of the EA Approval and permits required to be completed prior to the start of construction. Section 7 provides detail of these requirements.

Third party requirements will also include addressing public concerns, providing the public with project information, and adherence to the Community Impact Agreement between OPG and local municipalities, which may be categorized as 'tunnel specific' versus 'ongoing relationships with local stakeholders'. For public, host community and local political issues, the prime contact is NPG. The MOU (Appendix C) and associated protocols provide further details.

3.2 Tunnel Contract

Procurement of the Design/Build contract included the following key components:

- Expression of Interest (EOI) development
- EOI process
- Proponent pre-qualification
- contracting strategy
- establishing invitation process for Design/Build proposals
- Contract Terms and Conditions (T&C)
- construction labour agreements
- honorarium details
- insurance requirements
- bonding requirements
- Geotechnical Baseline Report (GBR) preparation, including negotiation and agreement with Contractor
- tunnel flow requirement and contracting strategy – GFA, liquidated damages and bonuses
- alignment options analysis (St. Davids Gorge)
- Concept drawings
- drafting of Design/Build Invitation document
- Site meetings and tours
- technical proposal analysis
- commercial proposal analysis
- proposal analysis report
- negotiation of both commercial and technical aspects of the contract, and agreement with the Contractor
- signing of the Agreement.

3.3 Tunnel Construction

The horizontal tunnel alignment generally follows the line of the two existing tunnels, under the City of Niagara Falls. In conjunction with the project, additional subsurface rights are being obtained. The subsurface rights to be obtained will include those necessary for the new tunnel as well as those which may be necessary if a fourth tunnel is constructed in the future. A tunnel boring machine ("**TBM**") will be utilised to construct the tunnel. Tunnel construction will commence from the outlet area.

3.3.1 Intake Area

The Intake Area includes development of a suitable area for the Contractor's lay down area, shops and offices. The area available for the Contractor is on both sides of the Niagara Parkway. To ensure separation of construction traffic from the tourist traffic, access to the construction yard will be along a new separate access road to be constructed out to Portage Road. OPG

committed to install temporary signalization at the Niagara Parkway at Portage Road to minimize impacts on through traffic during construction.

At certain times, the Contractor requires access to the INCW bridge deck and will have to work within the river to undertake in-water excavation of the intake channel, installation and removal of the cofferdam, removal of the existing ice accelerating wall and construction of a new wall, closure of the downstream Bay 1 and construction of portions of the intake approach wall. During these periods of work, OPG will be the "Constructor" under the Occupational Heath and Safety Act when work is performed under the 'INCW Part Project' designation. This approach has received approval from the Ministry of Labour.

3.3.2 Outlet Area

The main construction facilities are on OPG's lands, located between the PGS Reservoir and the existing Sir Adam Beck 2 canal. Access is provided by a new road connection to Stanley Avenue. Temporary signalization is required at the intersection with Stanley Avenue and is being installed by the Regional Municipality of Niagara on behalf of OPG.

3.3.3 Intake Structure

The intake structure is a reinforced concrete structure that will be constructed underneath the INCW, located upstream from the Niagara Falls. The design of the intake (through the use of numerical and physical models) has been examined extensively to optimize flow conditions and minimize ice entrainment. The structure will house sectional service gates for closure of the diversion tunnel at the upstream end. Ice management during intake construction (cofferdam in place) has also been numerically modeled and determined to be comparable to existing conditions.

The majority of the intake excavation will be done within a cofferdam that must be completed prior to the break-through of the TBM. Prior to cofferdam construction, a new accelerating wall, used to facilitate ice management at the intake, will be constructed and the existing accelerating wall will be demolished. Following completion of the concrete works, the cofferdam will be removed.

It is expected that extensive grouting will be required of the upper rock formations to minimize water inflows into the tunnel during the TBM drive through these formations. In addition, underwater excavation of an intake channel is required upstream from the intake structure and beyond the confines of the cofferdam.

3.3.4 Diversion Tunnel

The tunnel is to be excavated from the downstream end through limestones, sandstones and shales using a 14.4 m excavated diameter TBM to be supplied by the Contractor. The tunnel will be constructed in two passes with the first pass consisting of excavation and an initial lining to support the excavation consisting of shotcrete, mesh, bolts and ribs. Once the complete tunnel is excavated and the TBM removed, a cast-in-place concrete final lining between 600 and 700 mm thick will be constructed. An impermeable membrane will be placed between the initial and final lining to ensure watertightness of the tunnel. The final lining will be prestressed using high pressure grout injected between the impermeable membrane and the initial lining.

The tunnel will cross various geological formations. Tunnel lining design will address time dependent deformation characteristics of the host strata. The swelling component of the time dependent deformations will be eliminated by providing a watertight membrane as discussed above that will prevent contact of fresh water with the swelling shales and diffusion of chloride ions out of the pore water of the shales. This will eliminate the advection and diffusion process necessary to promote swelling.

On completion of the tunnel and following tunnel water-up, a flow test will be performed to establish whether the tunnel meets the GFA. The testing will be done by a tester jointly agreed and provided by OPG and the Contractor. The results of the testswill be used to determine the final GFA on which liquidated damages or bonuses will be based.

3.3.5 Outlet Structure and Channel

The outlet structure is a reinforced concrete structure, housing the closure gate and provisions for sectional service gates for closure of the diversion tunnel.

Water from the diversion tunnel will be discharged into the existing canal system feeding the Sir Adam Beck generating complex.

PGS operation will need to be constrained, for a short period of time, to facilitate removal of the rock plug and removal of the PGS Dewatering Structure.

3.4 Enabling Activities and Miscellaneous Construction

A number of enabling activities must be performed prior to commencement of the tunnel work, including the following.

3.4.1 Establishing Expropriation Rights

Expropriation rights have been made available to OPG through Bill 100, Electricity Restructuring Act, Section 51. OPG will be placing a plan of expropriation for the entire tunnel length which will provide

- the most timely, certain and cost effective approach to correcting any outstanding deficiencies or questions as to the scope and quality of OPG's existing rights
- securing additional subsurface land rights required in connection with the third tunnel construction and those rights necessary if a fourth tunnel is constructed in the future.

3.4.2 Real Estate Mapping

An external land surveyor has been retained by OPG Real Estate to determine the location of property required for the tunnel(s). The surveyor is responsible for producing reference plans identifying the location for all properties where rights are required.

3.4.3 Third Party Real Estate

With respect to privately-owned property, OPG Real Estate will expropriate the necessary property rights from private property owners where underground rights are required. Property owners will all be notified of the expropriation either by mail or personal visit.

3.4.4 City and RMON Right-of-Way Acquisitions

With respect to municipally owned property, OPG Real Estate will expropriate subsurface property rights from the City of Niagara Falls and the Regional Municipality of Niagara. The majority of these properties consist of road crossings.

3.4.5 NPC Real Estate Acquisitions

With respect to property owned by the Niagara Parks Commission, OPG Real Estate is acquiring via negotiated agreement the necessary surface and subsurface property rights from the Niagara Parks Commission.

3.4.6 Railroad Right-of-Way Acquisition

With respect to the underground crossing of railway corridors owned by Canadian National and Canadian Pacific Railways, OPG Real Estate will be acquiring by negotiated agreement the necessary subsurface rights. OPG does not have the right to expropriate these properties.

3.4.7 Road Improvements

The section of Stanley Avenue, between Whirlpool Road and Niagara Townline Road is being widened to improve access to the main construction site at the outlet. Road improvements will include utility relocates and sewage and water connections for the Outlet area. A new turning lane is being provided at Portage Road and the new intake access road. A new turning lane will also be constructed at the intersection of Stanley Avenue and Thorold Stone Road to minimize the impact of construction traffic traveling south from the outlet construction area. The roadworks are being carried out by the Regional Municipality of Niagara (RMON) on behalf of OPG under the terms of the Community Impact Agreement.

3.4.8 Pre-Construction Condition Surveys

A number of structures in the vicinity of the site will be surveyed before commencement of construction to establish a basis for determining if the structure has been affected by the construction activities and to determine responsibility for repair, if necessary. The preconstruction survey work will be undertaken by OPG/OR and may involve a third party consultant. OPG/NPG and the Contractor will be required to endorse the preconstruction survey before commencement of construction activities that could result in damages to the existing SAB PGS or INCW facilities.

3.5 Project Management

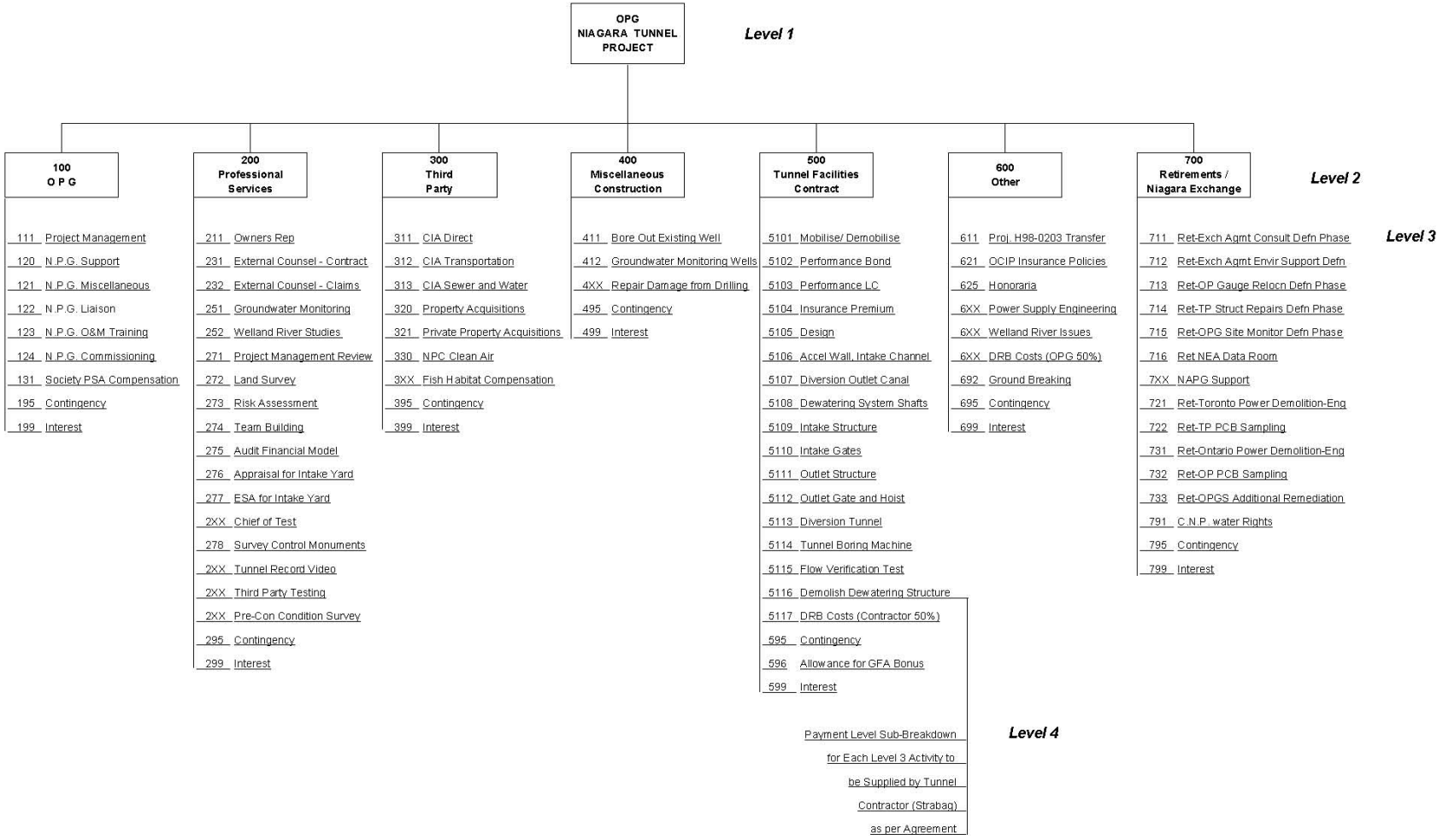
Management of the Project is a combined responsibility of OPG and the OR as defined later in the PEP. These two parties will work together as a team to enable the successful completion to the Project. Management activities will be assigned to one of the parties as the primary responsible party. The other party may provide specific support or may be consulted on certain activities as indicated in the Table 9.1. In either case, all parties will be informed of the activities of the other, as appropriate. The Project activities will be implemented through a single Project Director.

3.6 Exclusions

The following are not included in the project scope:

- dewatering pumps for tunnel
- sectional service gates at outlet
- permanent closure of the adit excavated for geotechnical investigation purposes.

Figure 3.1 Work Breakdown Structure



Notes:

1. Because of the nature of the Project Scope and Layout, it has been possible to set up the WBS and the CBS (see later) with the same basic structure.
2. Retirements are addressed in a separate PEP.

4 Project Authorization

The Minister of Energy announced the Niagara Tunnel Project in Niagara Falls on June 25, 2004. The Provincial Government's Bill 100, The Electricity Restructuring Act, was the catalyst for this announcement.The regulations passed under Bill 100 will enable OPG to fully recover prudently incurred costs of the project through its regulated rates. Financing for the Project will be provided by the Government of Ontario on this basis.

In June 2004, the OPG Board approved a budget of $10 million to initiate the implementation process for the Niagara Tunnel Project (Phase 1). Board approval was required before proceeding with award of the Design/Build contract for the tunnel (Phase 2).

The OPG Board of Directors approved expenditure of up to $985 million for the Project on July 28, 2005. Approval to provide financing for the Project was received from the Ontario Cabinet on August 17, 2005. The Design/Build Agreement between OPG and Strabag AG was signed on August 18, 2005.

5 Health and Safety Management

OPG considers safety as a primary objective with a Project goal to maintain a safe working environment that results in completion of the Project with zero fatalities, zero critical injuries, and zero lost time injuries while maintaining the safety of the public at all times. The OR will use additional indicators to measure safety success and program implementation. These will include observation of supervisor and worker competence, compliance to inspection schedules, timely closure of action items, completion of job safety plans prior to beginning new work scopes, provision of training and adherence to incident notification requirements.

From a Health and Safety perspective, other than in connection with work performed on the INCW Part Project, OPG will be the "Owner Only" for this project, with the Contractor designated as the "Constructor" under the Occupational Health and Safety Act (OH&SA). For the INCW Part Project, OPG is designated as the "Constructor" and will fulfill its responsibilities under OH&SA through the OR in the relationship with the Contractor.

5.1 Phase 1 Activities

5.1.1 Risk Assessment

Key safety risks that could impact both workplace safety and OPG's ability to meet all regulatory requirements include poor Contractor compliance with its safety program, the Site Specific Safety Plan or other contractual safety requirements, impact of the project on public safety, interface with OPG personnel, etc, have been incorporated into the project risk assessment which included OPG's plan to mitigate these risks.

5.1.2 Pre-Qualification of Contractors

Only organizations that were pre-qualified by OPG, with assistance from the OR, were allowed to submit a proposal for the Design/Build Contract. The pre-qualification process, managed by OPG's Supply Chain, evaluated three aspects of the prospective organizations' safety performance: external safety performance (WSIB data, regulatory compliance, etc) safety performance at all OPG sites and the Contractor's overall Safety Program obtained from a detailed OPG Contractor Pre Qualification Questionnaire.

5.1.3 Project Safety Plans

Each proponent was required to include a preliminary Project Specific Site Safety, Site Security, Public Safety and Emergency Response Plan for all project activities including those of subcontractors as part of their proposal to ensure that their plans demonstrated appropriate key safety management processes (e.g., Hazard Identification and Control, Safe Work Planning, Supervision, Workplace Inspections, Senior Management auditing, Subcontractor management, Incident Management, Housekeeping, Emergency Management, Safety resources, etc), meet OPG's expectations and mitigate all major operational safety risks. This plan was required to be sufficiently robust to provide assurances to OPG, as the "Prudent Owner", that the Contractor could fulfill all safety obligations during the project. The OR and OPG's Project Director evaluated this plan with input as necessary from other OPG safety resources. This assessment of the submitted safety plans formed a part of the proposal evaluation process with a pre-defined

weighting assigned to this criteria. The successful proponent was also required to prepare equivalent safety plans for the INCW Part Project.

5.2 Phase 2 Activities

5.2.1 Owner Only

In OPG's "Owner Only" capacity on this project, the Contractor will be responsible for safety within its "construction island".

OPG has designated a "construction island" within which Strabag, the Contractor, will be responsible for health and safety, security and public safety. The Contractor is the "Constructor" as defined under OH&SA. The Contractor has prepared, and must implement and maintain comprehensive project site specific health and safety and security, public safety and emergency response plans. The Contractor is required to have these plans reviewed by OPG prior to initiating any construction activities.

The Contractor is required to submit final Safety Plans after signing the Agreement and these will be reviewed against the outline plans submitted with its Proposal. OPG has the right to perform periodic audits to ensure compliance with the safety plans and take action, including termination of the contract, if safety management and performance is unacceptable. The OR's responsibility is to provide Safety Review/Auditing of the Contractor's safety performance. The OR will review and audit against the contractual requirements and agreed Project Specific Site Safety, Security, Public Safety and Emergency Response Plan without providing direction as to how the noted deficiencies will be addressed.

A plan has been developed describing how OPG will fulfill its role as "Prudent Owner" in monitoring the execution of the contract from a safety perspective. These activities are fully detailed in the Niagara Tunnel Project's Policies and Procedures Manual. This plan keeps in mind the objective of not taking on the role of Constructor. The purpose of these activities is to ensure that contractual obligations are being met. This plan includes the following elements.

5.2.1.1 Review/Audit

Audit of the overall safety performance of the Contractor and contractual compliance through periodic site tours, periodic audits, Contract Review Meetings, Safety Reports, and similar high level review.

5.2.1.2 Communication

Communicate OPG's safety expectations at all stages of the project ensuring that expectations are high level and general in nature where the Contractor is "Constructor" and OPG is "Owner Only".

5.2.1.3 Incident Management

Requirements and process to reporting of incidents to the Niagara Tunnel Project.

5.2.1.4 Staffing

The OR will provide part time Safety staffing in an auditing role for the duration of the Project.

5.2.1.5 Interface Management

The OR will, when OPG is the Owner-Only, manage (avoid or minimize) all interfaces with OPG employees.

5.2.1.6 Training

OR staff will be properly trained, as required, to cover its activities and responsibilities.

5.2.2 INCW Part Project

For Part Project Area (as described below) activities carried out at the International Control Works (INCW) OPG will assume the role of "Constructor" at which times the Contractor will follow OPG's safety requirements. These policies require contractors and their subcontractors to maintain a level of safety equivalent to that of OPG employees while working at OPG workplaces. OPG, through the OR, as "Constructor", has the right to require changes to the Contractor's safety plans applicable to the INCW Part Project. OPG, its representatives and its contractors will meet all applicable health and safety legislative requirements.

Ongoing operational requirements by OPG/OR will constrain Contractor activities associated with some planned construction work in the intake and outlet areas. The need for OPG to operate control gates at the INCW for ice, flow and water level management will constrain in-water work at the INCW and construction activities utilizing the access to and along the INCW structure.

OPG applied to the Ministry of Labour and received approval pursuant to section 4 of the Construction Regulations under the Occupational Health and Safety Act (OH&SA) for the designation of a discrete portion of the Niagara Tunnel Facility Project as a separate part-project. Separating out the discrete part-project was an important part of optimizing safety and was necessary due to the physical (OPG must continue to operate the INCW water control structure) and legal constraints involved with portions of the work. For this aspect of the Project (the INCW Part Project), OPG will be the "Constructor" under the OH&SA, with the OR fulfilling OPG's obligations in this regard.

For work where OPG will be "Constructor" of the Part Project, OPG will provide input, including specific procedures to be followed, where necessary, and approve the site specific safety and site security, public safety and emergency response plans developed by the Contractor.

The INCW Part Project Safety Management Plan has been developed describing how OPG through the OR will fulfill its role as "Constructor" in the execution of the contract from a safety perspective. The purpose of this Plan is to ensure that OPG's OH&SA obligations are being met. The Plan includes the following elements.

5.2.2.1 Review/Audit/Compliance

Audit of the overall safety performance of the Contractor and contractual compliance through periodic site tours, periodic audits (such as compliance to pre-job safety briefings, inspection schedules, management audits, JSA completions and review and proper functioning of IRS system), Contract Review Meetings, Safety Reports, and similar reviews.

5.2.2.2 Communication

OPG communicates safety expectations at all stages of the project.

5.2.2.3 Incident Management

A matrix detailing reporting of incidents to OPG by the OR is included in the Plan.

5.2.2.4 Staffing

During the Part Project the OR will provide a full time Safety Officer, working under the guidance of the Project Safety Advisor.

5.2.2.5 Interface Management

OPG, through the OR, shall ensure, that,

- The measures and procedures prescribed by the OH&SA and applicable regulations are carried out on the project;
- Every employer and every worker performing work on the project complies with OH&SA and the regulations; and
- The health and safety of workers on the project is protected.

5.2.2.6 Training

OR staff will be properly trained, as required, to cover its activities and responsibilities. Training will include Project Orientation, Basics of Supervising, Fall Protection, Work Protection, Waterway safety, review of the Project Specific Safety Plan, First Aid/CPR and Polices and Procedures manual.

6 External and Internal Stakeholders

6.1 External Stakeholders

A large number of external (non-OPG and non-OR) stakeholders will be engaged during implementation of this project. OPG/NPG will take the lead with stakeholders where there is an ongoing relationship that will continue beyond the Project execution phase and the OR will handle only Tunnel Project specific contacts. Table 6.1 provides a listing of these stakeholders and their interests in the project. Communications with the public are addressed in Section 18.

Early and sustained engagement of external stakeholders will be critical to the successful outcome of the Project. The potential for adverse project impacts cannot be overstated if the project execution approach is not aligned with stakeholder requirements. External stakeholders will be updated by means of meetings, presentations and other mechanisms.

Table 6.1 External Stakeholders

Stakeholder	Statement of Interest
International Joint Commission - Foreign Affairs - International Niagara Board of Control	IJC gave approval in April 1999 for the construction of one tunnel. They had no concerns regarding water levels or trans-boundary concerns. IJC to be provided with project update for information.
Fisheries and Oceans Canada, Department of Fisheries and Oceans	Authorizations under Fisheries Act Conditions under Fisheries Act Authorizations
Canadian Coast Guard (Transport Canada)	Navigable Waters Project Act regarding exemption for intake structure work Operation in restricted waters
Ontario Ministry of the Environment	Conditions of EA Approval
	Certificates of Approval – Air; Industrial Sewage
Ontario Ministry of Natural Resources	Conditions of EA Approval
	Work Permits Lakes and Rivers Improvement Act
Ontario Ministry of Energy	Energy production/rate impact
Ontario Ministry of Finance	Financing for the Project Ontario Retail Sales Tax (ORST)
Ontario Independent Electricity System Operator (IESO)	Addition of electrical energy to provincial grid Outage coordination and approvals AGC operation
Ontario Ministry of Labour	Notices of Project
Niagara Parks Commission	Lease/use of NPC land for Intake Works Yard/access road. Disruption to Niagara Parkway. Groundwater monitoring location.
Niagara Escarpment Commission	Encouragement of reuse of Queenston shale

Table 6.1 External Stakeholders

Stakeholder	Statement of Interest
Niagara Peninsula Conservation Authority	Conditions of EA Approval addressing Welland River issues. Erosion and sediment control plans
Regional Municipality of Niagara	Conditions of EA Approval Community Impact Agreement (CIA) – compensation issues
	Transportation Plan Implementation
	Liaison Committee
	Reuse of excavated materials
City of Niagara Falls	Conditions of EA Approval Community Impact Agreement (CIA) – compensation issues
	Transportation Plan Implementation
	Liaison Committee
Town of Niagara-on-the-Lake	Conditions of EA Approval Community Impact Agreement (CIA) – compensation issues Pump and water line for irrigation system
Niagara Falls Tourism Industry	Community Impact Agreement through the City of Niagara Falls Condition 7.5 of EA Approval – regarding effects of Welland River water levels and fluctuations on sediment transport
Affected property owners	Subsurface rights
Fortis Ontario	Subsurface rights
Marineland	Subsurface rights Access around water monitoring well Traffic congestion
Building Trade Unions	Jurisdiction
Hydro One	Outage coordination Proximity to Hydro One transmission lines
Niagara Falls Hydro	Construction power supply
Canadian National Railway	Subsurface rights
Canadian Pacific Railway	Subsurface rights
New York Power Authority	Changes to flow patterns/ice flows

6.2 Internal Stakeholders

A large number of internal (OPG and non-OR) stakeholders will be engaged during implementation of this Project. Table 6.2 provides a listing of these stakeholders and their interests in the Project.

Early and sustained engagement of internal stakeholders will be critical to the successful outcome of the Project. The potential for adverse project impacts cannot be overstated if the project execution approach is not aligned with stakeholder requirements. Internal stakeholders will be updated by means of meetings, presentations and other mechanisms.

Table 6.2 Internal Stakeholders

Stakeholder	Statement of Interest
Niagara Plant Group/ Electricity Production	- Landlord - Client/Customer - Operate existing facilities - Facilitator for local contacts - Liaison with Niagara Region, City of Niagara Falls and Town of Niagara-on-the-Lake - Liaison with Niagara Parks Commission - Operating Restrictions and Outage Coordination - Design Review (outlet gate, hoist and controls and Intake service gates including handling and storage) - Administration of Work Protection Code - Contract Admin and Monitoring (monitoring well installation) - Records retrieval and permanent retention - Coordination on Site Security, Public Safety and Emergency Response - Commission new facilities/systems (Outlet Gate) - Transfer of Control of affected property and facilities - Review security, public safety and emergency response plans - Review commitments for ongoing post-project requirements - Waste disposal - Reuse Committee - Ongoing commitments on NPG (e.g., Certificates of Approval) - Coordinate clearance of interfaces (watermain power/ control cables at INCW - Memorandum of Understanding (MOU) and associated protocols defining interactions/ commitments between NPG and the Project
Energy Markets	- Operating Restrictions and Outage Coordination - Marketing Incremental Energy and ancillary products
Society of Energy Professionals	- Purchased Services Agreement regarding external engineering and professional resources
Power Workers Union	- Purchased Services Agreement consultation regarding external trades, drafting and clerical resources - Trades Work assignment under Chestnut Park Accord Addendum (CPAA)
Board of Directors/ Major Projects Committee	- Project approvals, direction and oversight

7 Approvals and Third Party Requirements

The identification of permits, approvals or third party requirements is the responsibility of the Contractor. However, OPG, assisted by the OR, has done significant work to advance the permitting process prior to award of the Design/Build Agreement. Tables 7.1A and 7.1B provide a preliminary list of permits, approvals and third party commitments required to implement the Project. This is part of a more detailed database which is used to track progress and report on the status of approvals. Additional permits, approvals and third party requirements are entered in the tracking database when they are identified. The following sections provide brief description of the main permits, approvals and third party requirements.

The abbreviations in Tables 7.1A and 7.1B have the following meanings:

- P = Primary responsibility for preparing and submitting required documentation, obtaining and implementing Approvals, as applicable
- P1 = Primary responsibility for preparing and submitting initial documentation, and reviewing and submitting final documentation and obtaining Approvals
- P2 = Primary responsibility for finalizing documentation and submitting to OPG for review, and supporting obtainment of Approvals
- S = Support to the Party with primary responsibility for developing documentation and obtaining Approvals including collecting and providing data and information, and attending meetings.

7.1 EA Approval Conditions

On October 14, 1998, the Minister of the Environment approved the Environmental Assessment (EA) for the Niagara River Hydroelectric Development (NRHD) submitted by Ontario Hydro (now OPG). Attachment A (referred to as the EA Conditions of Approval or Conditions) to that approval contains a number of conditions that must be met before, during and after construction of the Project. It should be noted that since the EA approval covers the entire NRHD, some of the conditions are not applicable to the current single-tunnel Project.

Table 7.1A only identifies applicable conditions. Because the EA was issued to OPG, it will be OPG/OR's responsibility to interact with MOE to obtain all necessary clearances of Conditions of the EA Approval. Certain of these conditions have already been cleared by MOE (conditions having received approval include Conditions 1.4, 1.6, 1.8, 2.1, 7.4, 7.5, 8.2, 10.1 and 10.2, Table 7.1A). Certain of these clearances require considerable involvement by the Contractor (in particular, Conditions 2.3.1, 3.1, 5.1, 7.2 and 9.4). The Contractor has been provided with draft submissions made to date to MOE, including all comments received from MOE, and is required to provide all relevant technical details to be able to finalize the documents. The Contractor is required to attend meetings with MOE or other approving agencies to ensure all issues are addressed and will prepare submission material for OPG/OR to submit to MOE.

7.2 Community Impact Agreement

A community impact agreement (CIA) was concluded between the local municipalities (City of Niagara Falls, Regional Municipality of Niagara and the Town of Niagara on the Lake) and Ontario Hydro (now OPG) on December 23, 1993. An amendment to the agreement was signed

in September 2005 by all parties to reflect the phased approach to the NRHD. The agreement defines how the municipalities will be compensated for disruptions predicted to occur during construction of the Project. It details payments required for use of certain services such as potable water, sewage and road improvements.

The CIA also provides a framework during project implementation for
- keeping the municipalities and local community informed of activities during construction
- co-ordination of emergency service needs
- development of a transportation management plan
- tourism impact management.

7.3 Fisheries Act Authorizations

Authorizations under the Sections 32 and 35(2) of the Fisheries Act were approved January 1995 with a number of conditions that had to be met prior to project implementation. These initial authorizations were valid until January 31, 2000. A subsequent amendment was valid until December 31, 2005. A second amendment extended the approval to October 14, 2008. A third amendment was issued on June 1, 2005, extending the approval to December 2010. OPG has confirmed that all major outstanding issues arising from the Section 35(2) Authorization have now been addressed except for execution of a habitat compensation plan and those issues related to construction activities. A compensation plan for loss of fish habitat has been accepted by Fisheries and Oceans Canada (DFO). OPG's plan is to assist with the Draper's Creek Restoration Project. OPG/OR will have to meet any compliance monitoring which is imposed by DFO as part of the condition of approval, e.g., pre- and post-construction fish population studies are required.

The Fisheries Act Authorization under Section 32 of the Fisheries Act (Authorization to Destroy Fish by any Means other than Fishing) details conditions for blasting and will be the Contractor's responsibility to follow.

7.4 Canadian Coast Guard

An OPG request for exemption under the Navigable Waters Protection Act has been approved and no further action is required, other than updating the Canadian Coast Guard on the status of the project.

7.5 International Joint Commission (IJC)

A report was received from the IJC April 30, 1999, recommending that the first tunnel could be constructed with no concerns. Formal acknowledgement has been received by OPG from Foreign Affairs that no further action is required.

7.6 Other Permits and Approvals

Table 7.1B is a list of other permits and approvals to be obtained. Most of these are related to construction activities and will be the Contractor's responsibility.

Table 7.1A EA Approval Conditions

EA Condition Number	Summary of Condition	Responsibility for Developing Documentation and Obtaining Approvals	
		OPG/OR	Contractor
1.1	Compliance with EA	P	
1.2	Delay to construction	P	
1.3	Expiration of Approval	P	
1.4	Implementation Plan for Phased Construction	P	
1.6	Compliance Monitoring Program	P	
1.8	Implementation Plan for Undertaking	P	
1.9	Procedure for Amending EA	P	
1.10	Notification Procedure for Minor Amendments	P	
1.11	Facilitate information flow requirements under the Community Impact Agreement	P	
1.12	Provision of public record documents	P	
2.1	Establish Re-Use of Excavated Materials Committee	P	
2.2	Preparation of Re-Use of Excavated Materials Report	P	
2.3.1	Submit plan for disposal of excavated materials on OPG lands	P1	P2
3.1	Disposal Monitoring and Contingency Plan for BTX	P1	P2
4.1	Hydrogeology – groundwater mapping	P1	P2
4.2	Hydrogeology – groundwater monitoring plan	P1	P2
5.1	Construction effects of tunnel and shafts	P1	P2
7.1	Documentation of the effects of flow changes on a number of components	P	
7.2 a	Documentation on effectiveness of mitigation measures to address TSS loadings	P1	P2
7.2 c	Erosion and Sedimentation Control Plans	P1	P2
7.4	Assessment of the effects of reduced flows in the lower Welland River to fish habitat and to adjacent properties/users	P	
7.5	Demonstration that hydraulic grade line in Welland River will remain within present range and not reduce sediment carrying capacity	P	
8.1	Ontario Hydro Noise Protocol to be followed	P	
8.2	Reassessment of Noise assessment	P	
9.2	Citizen Complaints Procedure	P	S
9.4	Erosion and storm water runoff plan	P1	P2
9.5	Carry out Community Impact Agreement	P	S
10.1	Aquatic habitat survey and habitat compensation if applicable	P	
10.2	Verification of design to limit fish entrainment at intake	P	

Table 7.1B Other Permits and Approvals

Approval	Key Agency	Responsibility	
		OPG/ OR	Contractor
International Niagara Diversion Treaty, 1950	International Joint Commission, External Affairs Canada	P	
Navigable Waters Protection Act	Fisheries and Oceans Canada (Canadian Coast Guard) now Transport Canada (Marine)	P	S
Transportation of Dangerous Goods Act	Transport Canada		P
Temporary magazine licence	Natural Resources Canada, Minerals and Metal		P
Authorization of destruction of fish by means other than fishing	Fisheries and Oceans Canada	P	S
Authorization for harmful alteration, disruption or destruction of fish habitat	Fisheries and Oceans Canada	P	S
Work Permits (under Lakes and Rivers Improvement Act)	Ministry of Natural Resources	S	P
Permit to take water (construction)	Ministry of the Environment		P
Certificate of Approval (AIR)	Ministry of the Environment		P
Certificate of Approval for an Industrial Sewage Works	Ministry of the Environment	S	P
Generator Registration	Ministry of the Environment		P
Dust Suppressant License	Ministry of the Environment		P
Liaison Committee	Regional Municipality of Niagara, City of Niagara Falls, Town of Niagara-on-the-Lake, OPG	P	S
Transportation Impact Management	Regional Municipality of Niagara/City of Niagara Falls	P	S
Tourism Impact Management	City of Niagara Falls, Town of Niagara-on-the-Lake	P	S
Emergency Services	City of Niagara Falls, Town of Niagara-on-the-Lake, Regional Municipality of Niagara	P	S
Municipal Services	City of Niagara Falls, Regional Municipality of Niagara	P	S
Municipal Approvals	City of Niagara Falls, Regional Municipality of Niagara	S	P
Transport Canada	Boat access restrictions at INCW		P

8 Execution and Delivery Strategy

8.1 Project Phasing

As indicated in Section 1 of this plan, the Niagara Tunnel Project will be executed in two distinct phases as follows:

- **Phase 1 (Planning and Procurement Phase)** – Project activation, procurement of construction and service contracts, liaison and coordination with approving agencies and others, agreements with stakeholders.
- **Phase 2 (Design/Construction and Commissioning Phase)** – Detail design and construction of the diversion tunnel and related works, commissioning of the tunnel and project closeout.

8.2 Project Resources

The Niagara Tunnel Project is being designed and constructed by a Design/Build Contractor. OPG has not designed or constructed hydroelectric facilities, including major diversion tunnels, for several decades and as a result the specialist skills required for this work are not available within the organization. Therefore, for this project, some of the Owner's activities have been assigned to an outside consultant, acting as OR. It may be necessary for the OR to engage specialist contractors to perform specific assignments.

OPG has labour agreements with the Power Workers Union and the Society of Energy Professionals. These collective agreements include requirements for OPG to gain agreement and/or to engage in discussions with the union representatives to contract out work. Approval/discussions to contract out this work have been completed with both unions.

8.3 Contracting Approach

OPG had previously determined that the diversion tunnel be implemented through a Design/Build Contract. This approach has been reviewed and refined based on lessons learned on other projects, current contracting practices, the latest information on tunnel technology, and the objectives of the Project. The Design/Build approach was maintained in order to maximize the degree of certainty of cost outcome due to single point accountability for both design and construction. The Design/Build approach also would permit OPG to canvass the design creativity of the marketplace instead of being restricted to a single design, which would result in cost or schedule savings. The contract was structured to reward early project completion, and better than target tunnel flow performance while providing for competitive pricing from the contractors.

8.4 Risk Allocation

At the time that this Project was re-activated in June 2004, OPG management intended to pursue a fixed price contract that allocated the risk of differing site conditions (subsurface geological) to the Contractor. Following significant discussion on this subject, including review of industry "norms", it was concluded that such risk should be borne by OPG. Other risk allocation decisions were determined through extensive discussed between OPG, OR and outside legal counsel.

A Geotechnical Baseline Report (GBR), initiated during the proposal stage and finalized prior to contract award, will form the basis for evaluating claims for Differing Site Conditions (DSCs). An innovative multi-step process has been adopted for the preparation of the GBR. An initial

GBR-A was prepared by OPG/OR and included with the proposal invitation. Proponents (contractors) were required to submit their responses to the document (GBR-B) with their proposal. The contract GBR (termed GBR-C) was then negotiated between OPG and the Contractor to document the agreed baseline.

8.5 Insurance

OPG has utilized its internal insurance expertise and advice from Marsh, its insurance broker, to determine an appropriate insurance program for the Project. OPG will provide an Owner Controlled Insurance Policy (OCIP) to cover the entire undertaking. Insurance coverage provided by OPG includes Wrap-Up Liability (WUL), Builders All Risk (BAR) Marine Cargo and supplementary Errors and Omissions (E&O) Insurance. The Contractor is required to provide coverage for Workers Compensation, Motor Vehicle Insurance, Constructor Equipment Insurance, and E&O Insurance.

8.6 Bonding and Security

The Contractor has provided a Letter of Credit in favor of OPG in the amount of $70 million. This security allows OPG to draw in the event of a default of the Contractor to meet the date set for Substantial Completion and failure of the Contractor to meet certain obligations.

The Contractor is required to provide a Maintenance Bond generally to cover its obligations regarding correction of defective work and performance of warranty work.

Strabag has also provided parental indemnities from its holding companies.

9 Organization, Roles and Responsibilities

9.1 General

This section of the PEP identifies the organizational approach envisaged for overall management of the Project and describes roles and responsibilities for key members of the project team.

A functionally integrated project management team, consisting of OPG and consultant (OR) staff, has been formed to manage the project. This management team will be empowered with adequate authority and have access to appropriate resources to successfully execute the project. They will be responsible for accomplishing Project goals by undertaking project planning and project configuration and by overseeing and monitoring all aspects of design, construction, commissioning and project closeout.

9.2 Division of Work

A coordinated and sustained multi-disciplinary effort by OPG staff, the OR and the Contractor will be essential for the successful execution of the Project. The division of functional responsibility must be clearly understood and adhered to by all project participants. Table 9.1 provides a summary of the allocation of project responsibilities.

Table 9.1 Functional Responsibilities

Function	Responsibility		
	OPG	OR	Contractor
Project Setup			
Project Direction and Oversight	R		
Risk Assessment – Phase 1	R	C	
Risk Assessment – Phase 2	C	R	
Risk Management Plan	A	R	
Risk Management Plan – Contractor			R
Legal – Corporate and Project	R		
Legal – Real Estate	R	C	
Real Estate Acquisition	R	S	
Financial Modeling Economic Evaluations/Business Case	R	S	
Project Charter	R	S	
Project Execution Plan	A	R	
Engage OR and administer OR contract	R		
OPG Union Agreements	R		
Insurance/Bonding/Tax Requirements	R	C	
EOI response	C	R	
Project Procurement Planning/Execution			
Contract Execution and Other Commitments	R	C	
Procurement – Policy/Strategy	R	C	
Procurement – Execution	C	R	
Functional Requirements (engineering)	A	R	
Geotechnical Baseline Report Preparation	C	R	C
Evaluation of Proposals	A	R	
Coordination of proposal invitation process	I	R	

Function	Responsibility		
	OPG	OR	Contractor
Project Permits/Approvals			
EA Conditions of Approvals (see Table 7.1a)			
Permit Applications (see Table 7.1b)			
Community Impact Agreement	R	C	C
Project Design/Construction			
Preliminary/Detail Design	C	C	R
Construction		C	R
Construction Monitoring including environmental	I	R	C
Construction Safety Management (OPG Owner Only)			R
Construction Safety Compliance Monitoring (OPG Owner Only)	I	R	C
Construction Safety Management (Part Project)	C	R	
Tunnel Flow Test	A	C	R
Start Up and Commissioning (commitments beyond Project execution must be approved by NPG	C	C	R
Engineering Support to OPG	C	R	
Facilitate DRB Establishment	I	R	C
Construction monitoring/claims management	I	R	
Quality monitoring	I	R	
Environmental compliance monitoring	I	R	
Project Controls/Reporting			
Contract Administration	C	R	
Project Cost Estimate	A	R	
Project Scheduling	A	R	
Contract Scheduling	A	R	
Project Controls including Change Control	A	R	C
Project Accounting	R	C	
Projection of Cash Requirements	R	C	
Project Payments	R	C	
Project Reporting (Except Cash Reporting)	C	R	
Project Closeout Documentation	C	R	C
Document Management	C	R	
Action Tracking	C	R	C
Financial reporting requirements	R	C	
WBS development	A	R	
Design/Build contract administration	I	R	C
Change Control Board (CCB) setup	C	R	
Change management	A	R	
Project Communications			
Third Party Liaison (see MOU and Protocols)			
Third Party Agreements – Liaison	C	R	
Public and Media Relations/Shareholder Contact	R	C	C
Public communications support	R	I	I
Communication plan	R	C	I
Citizen Complaints (see MOU Protocol)			

R = Responsible for executing the work
A = Must approve (including review)
C = Must be consulted (includes support, review and other input)
I = Must be informed (for information only, no action needed)

9.3 Organizational Approach

9.3.1 Phase 1 Organization

At its highest level, the organizational and reporting structure for the Project during Phase 1 is illustrated in Exhibit 9.1. OPG's Project Director, who is ultimately responsible for project execution, reports to the Project Sponsor, who in turn reports to OPG's President and CEO, and ultimately to OPG's Board of Directors and its Major Projects Committee. The Project Director is supported by the OR team, by a team of OPG support staff and by external consultants, including legal counsel.

Exhibit 9.2 shows the Project organization in Phase 1. It illustrates the key support functions provided by OPG staff such as, Real Estate, Legal, Procurement, Finance, Public Affairs and Risk Management and those functions provided by third party consultants, and also illustrates the key functions provided by the OR team, namely, Project Management Advice and Support, Project Controls, Engineering Support, Third Party and EA Support and Contracts and Construction Support.

OPG oversight of the project team activities is provided by the Project Director. One of the key roles of the Project Director is to ensure the effective integration of OPG and OR resources with the appropriate mix of skills and experience. Another key responsibility of the Project Director is to facilitate effective and timely communications between the project team and other internal and external stakeholders.

9.3.2 Phase 2 Organization

The organization structure during Phase 2 is illustrated in Exhibit 9.3.

OPG's Project Director reports to the Project Sponsor who provides the link to OPG's President/CEO and Board of Directors. The Project Director is supported primarily by the OR team and a small number of OPG staff providing services such as Real Estate, Legal, Financial, Procurement, Risk Services and Public Affairs. The OR provides for direct liaison with the Niagara Plant Group through a Single Point of Contact (SPOC).

The OR team, led by the Project Manager, provides project and construction oversight services, project controls, environmental support and third party liaison. The OR team is also responsible for design review through the Engineering Manager. Construction oversight is provided through the Construction Manager who is responsible for monitoring the Contractor's on-site work for adherence to the Design/Build Agreement.

9.4 Roles and Responsibilities

Table 9.2 identifies the roles of the key project team members and provides a listing of their responsibilities.

Exhibit 9.1 – Summary Organization Chart – Phase 1

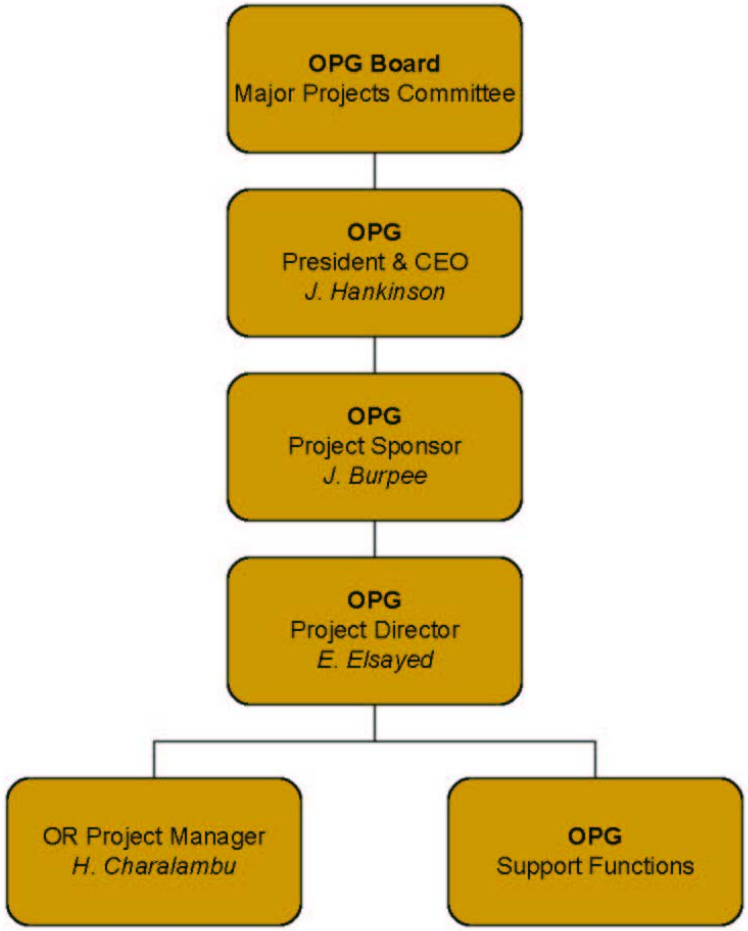


Exhibit 9.2 – Overall Project Organization – Phase 1

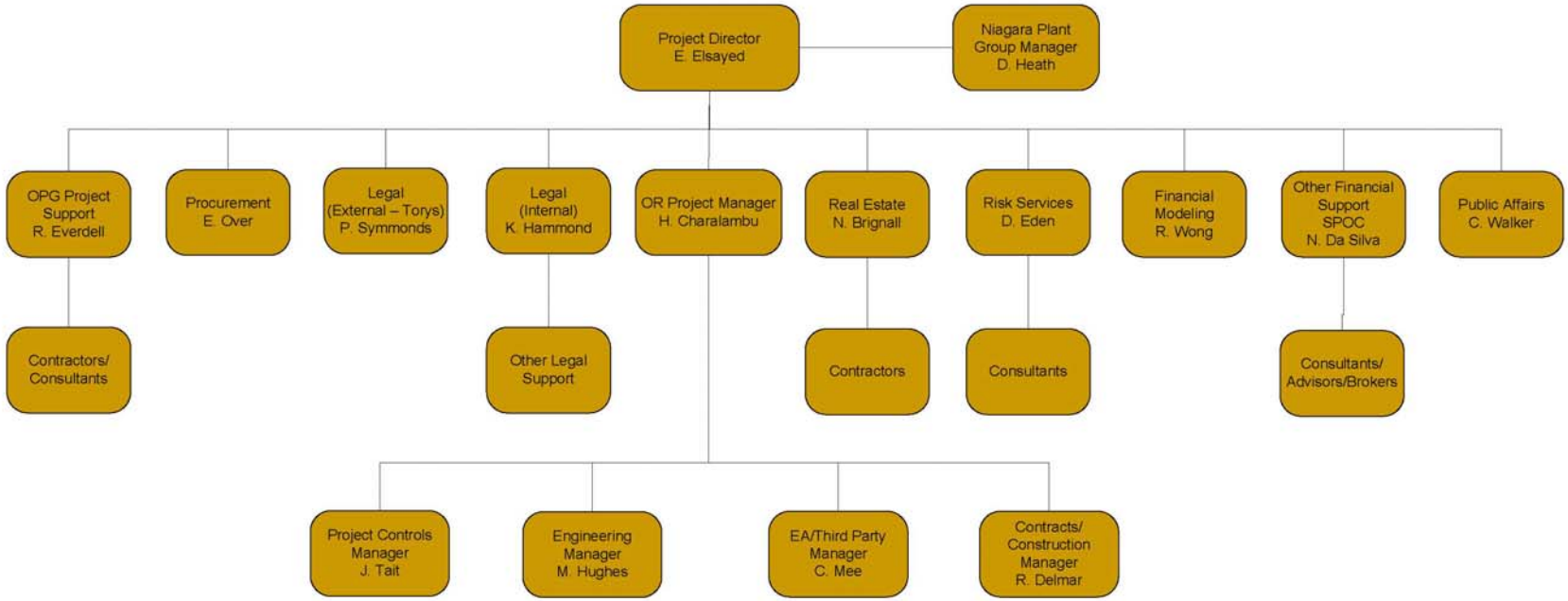


Exhibit 9.3 - Summary Organization Chart – Phase 2

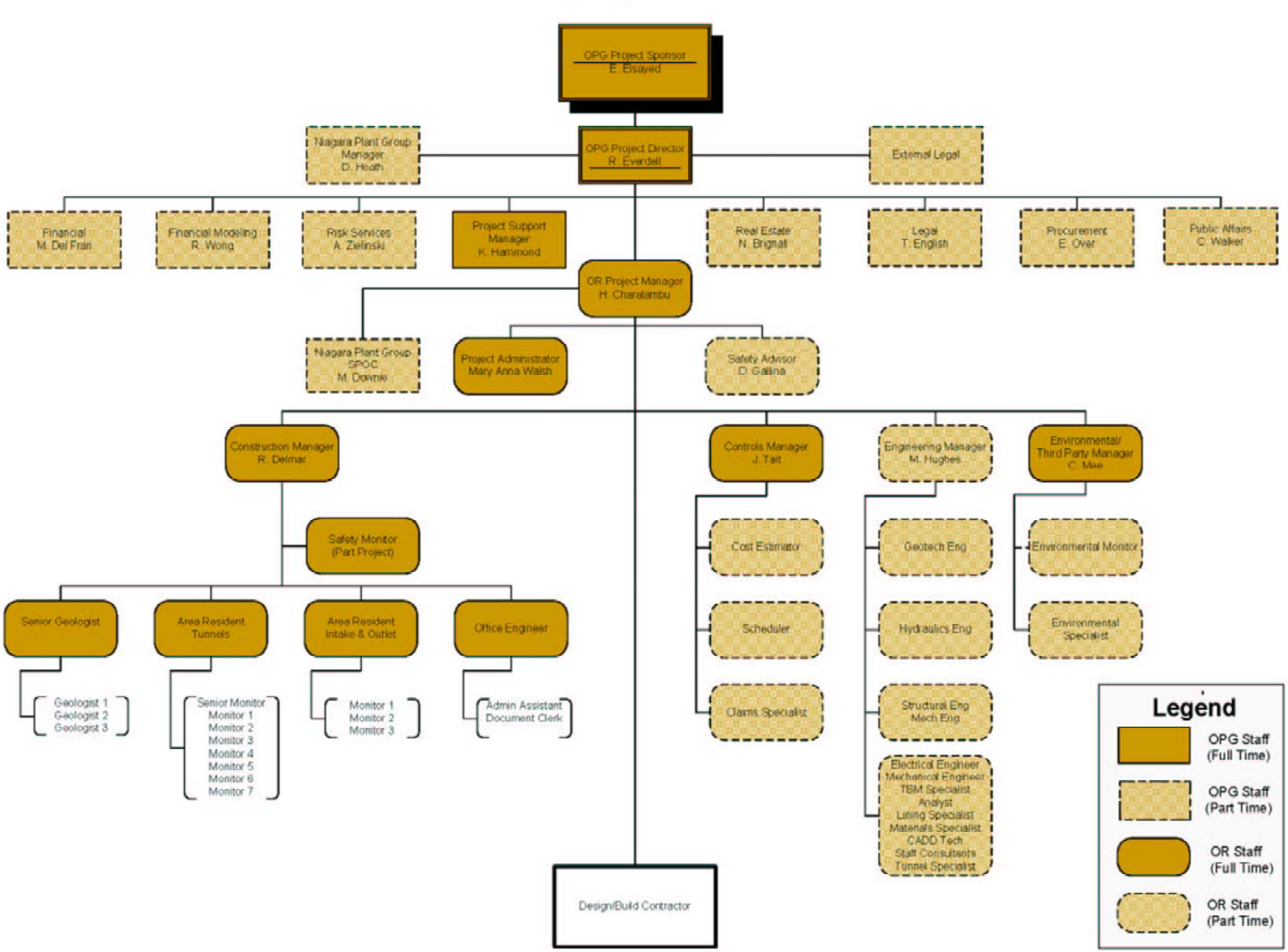


Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
OPG Board	Ontario Government	• Establishes strategic objectives for the project • Approves project scope, budget and schedule • Provides oversight of advocacy and government relations activities • Monitors overall project performance
OPG Major Projects Committee	OPG Board	• Overview of project execution approach and advice regarding planning and configuration of project • Overview of project team performance • Provides strategic advice regarding project delivery • Advises OPG Board on project delivery issues
OPG President and CEO	OPG Board	• Provides senior management oversight • Provides guidance in terms of corporate direction, priorities and business drivers • Provides the project link to the OPG Board and shareholder (the Ontario Government)
OPG Project Sponsor	OPG President and CEO (Phase 1)/Executive Vice President – Hydroelectric (Phase 2)	• Project Sponsor • Provides senior management oversight • Issues the Project Charter • Member of the Change Control Board • Reviews and endorses Project Execution Plan and Project Communication Plan • Reviews project Risk Management Plan for adequacy • Updates OPG Board/Major Projects Committee/Executive Committee • Facilitates funding approval • Resolves OPG organizational impediments to project success

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
OPG Project Director	OPG Project Sponsor	• Accountable for the overall delivery of project in accordance with safety, cost, schedule, and quality objectives • Integrates OPG's work activities with those of the Owner's Representative (OR) and other project participants • Reviews and facilitates approval of project cost estimates, budgets and timelines • Oversees negotiation of the tunnel Design/Build Contract and any subsequent amendments • Develops responsibility matrix with OR project manager • Approves OR project delivery team • Ensures availability of appropriate OPG resources • Ensures adequacy of project reporting to meet OPG's requirements • Member of the Change Control Board • Facilitates communication between project team and other internal and external stakeholders • Oversees public communications efforts for the Project • Oversees liaison with external stakeholders • Ensures information distribution within OPG • Monitors ongoing performance of project participants (OR and OPG staff) and others • Oversees the preparation of the Business Case Summary for project approval • Manages the execution of the Niagara Exchange Agreement • Manages OR contract • Prepares Project Charter

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
Niagara Plant Group Manager	Senior Vice President - Electricity Production (Phase 1)/Executive Vice President – Hydroelectric (Phase 2)	• Identifies Plant Group requirements (as the internal OPG customer for the project) • Provides input to the project team regarding interface issues between the project and the Plant Group • Provides support to the project as required • Provides the project interface with local stakeholders • Response to any citizen complaints related to the Niagara Tunnel Project • Signs off on physical characteristics depicted in the proposal invitation documents • Accepts the project facilities upon completion and meeting the Project quality objectives • Appoints a Single Point of Contact (SPOC) to provide day-to-day interface with the project team • Participates in team meetings as required
Niagara Plant Group SPOC	Niagara Plant Group Manager	• Provides a Single Point of Contact with the project team, representing the Niagara Plant Group • Facilitates /coordinates Plant Group input / review • Coordinates Plant Group support for the Project, as required • Represents the Plant Group at team meetings • Facilitates Plant group sign off/acceptance

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
Project Manager (OR)	OPG Project Director	• Supports Project Director with respect to communications and government agency relations • Provides oversight and monitoring of the tunnel Design/Build Contract to facilitate achievement of the Project's safety, cost, schedule and quality objectives • Oversees project controls and reporting functions • Prepares and updates Project Execution Plan • Supports the development of project Communications Plan and Contracting Strategy Approach • Develops responsibility matrix with Project Director • Selects OR project delivery team • Manages and is responsible for the activities of the OR team • Oversees preparation of project cost estimates, budgets and timelines • Directs preparation and updating of the project Risk Management Plan • Supports preparation of Project Risk Register and oversees its maintenance • Chairs Change Control Board • Oversees preparation of project status reports • Review and acceptance of Design/Build Contract and preparation of all technical schedules to the Design/Build Contract • Reviews bids and proposals and provides recommendation(s) for contract award • Supports negotiation of tunnel contract • Approval of third party invoices and Contractor applications for progress payments • Provides formal point of contact with Design/Build Contractor

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
OPG Project Support Manager	OPG Project Director	Supports the OPG Project Director in the following areas: • Interface with the Niagara Plant Group on project related issues (Phase 1 only) • Facilitate project support from OPG groups as required • Coordinate/integrate internal OPG project requirements (e.g., business planning, budgeting, reporting, presentations, BCS preparation) • Conduct internal studies/reviews in support of the project • Act as OPG's representative in dealings with regulatory agencies as assigned (e.g., MOE meetings, re-use committee, etc) • Establish/communicate internal OPG requirements pertaining to the project (e.g., records management) • Act as OPG's primary contact for Team Building initiative • Participates in proposal/bid evaluations • Supports contract negotiations, as required • Acts as the Project Director delegate as required

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
Controls Manager (OR)	Project Manager (OR)	• Responsible for establishing and utilizing appropriate procedures and systems to monitor, control and maintain project cost and schedule within set objectives • Development of project timelines • Development of project cost estimate • Preparation of overall project status reports • Provision of project cost data for input to OPG SAP system • Member of the Change Control Board • Review of third party invoices and Contractor applications for progress payments • Provides commercial contract administration for construction and other contracts • Develops and maintains project Action Tracking database

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities

Engineering Manager (OR)	Project Manager (OR)	• Overall responsibility for the engineering requirements of the project
		• Management of activities of OR engineering staff
		• Preparation of necessary engineering studies to support the project
		• Provides engineering support to OPG
		• Phase 1
		  • Preparation of technical documentation for inclusion in contract documents
		  • Administration of third party contract work
		• Phase 2
		  • Development and management of the design review process for the Contractor's submissions
		  • Support preparation of cost estimates and schedules
		  • Manage engineering support during tunnel construction
		  • Manage and participate in submittal review process, including additional supporting engineering activities
		• Review the Contractor's commissioning procedures

Construction Manager (OR)	Project Manager (OR)	Phase 1 • Provides support with regard to construction and constructability issues • Supports development of the project cost estimate • Supports discussions with regulatory authorities • Leads technical evaluation for proponent pre-qualification • Provides advice with respect to contract formation • Supports development of concept design and proposal invitation with respect to construction and constructability issues • Reviews bids and proposals and provides recommendation(s) for contract award • Supports negotiation of tunnel contract

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
		Phase 2 • Organize and lead the construction oversight team to monitor the Contractor's compliance with the Design/Build Agreement documents • Maintain liaison with the Contractor • Receive and coordinate timely review and return of Contractor submittals • Review the Contractor's construction and installation methodology and schedule submissions and monitor performance of the work against these documents • Review the Contractor's QA/QC program and results obtained • Monitor and report on the progress of the work including quantity of work performed, materials installed and manpower and equipment employed • Arrange for establishment of project survey control network and periodic survey audits of the work • Compile a substantial performance 'punch list' and review the Contractor's completion of the work and ensure all items are completed • Maintain a comprehensive photographic record of the progress of the work • Make recommendations for substantial and final completion certificate • Make recommendations as to validity of any changes requested by the Contractor • Site Supervisor for INCW Part Project work • Coordinate with RMON on municipal road improvements under CIA

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
Environmental/Third Party Manager (OR)	Project Manager (OR)	• Provides the main point of contact between the project and the approving and permitting authorities with support from the Niagara Plant Group for local initiatives • Development and maintenance of the Permits/Approvals tracking database for those items included in Section 7 as OR responsibility • Development of a timeline for obtaining of approvals and permits in a manner consistent with the project schedule • Identification of responsibilities for obtaining of permits and approvals • Coordinates transportation management plan and road upgrades/infrastructure requirements • Reviews environmental management plans • Submission of clearances for Conditions of EA Approval • Audit compliance monitoring and Contractor's environmental monitoring plans • Compliance with monitoring requirements for Fisheries Compensation Plan • Submission of annual compliance monitoring reports to MOE • Attendance at Liaison Committee Meetings and provision to committee of all compliance monitoring reports • Oversee monitoring/auditing of construction activities for environmental compliance

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
Safety Advisor (OR)	Project Manager (OR)	• Provides advice, strategies and problem solving on health and safety matters • Promotes a culture where health and safety are a prime value that will never be compromised • Monitors the development, maintenance and implementation of the Project Safety Management plan in accordance with contractual requirements plus any Legislation applicable to the Project • Develops and implements OR staff training where required • Coordinates Project incident statistics and reporting for the OR • Monitors safety and health legislative requirements • Manages the project audit program • Regularly attends Contractor's toolbox meetings
OPG Legal – External	OPG Project Director	• Provides legal advice on risk allocation and commercial best practices (Phase 1) • Preparation of Design/Build Contract, excluding technical schedules (Phase 1) • Participates in proposal evaluations (Phase 1) • Supports negotiation of tunnel contract and subsequent amendments • Provides/oversees specialty legal support (e.g., construction litigation, health and safety, environment, real estate, water rights) • Review of communications with third parties, as required • Provides general legal advice to the project • Provides legal support regarding claims and disputes, as required

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
OPG Legal – Internal	OPG Project Director	• Provides general legal and business assistance to the project • Provides/coordinates specialty legal support (e.g., construction litigation, health and safety, environment, real estate, water rights) • Participates in proposal evaluations (Phase 1) • Supports negotiation of tunnel contract and subsequent amendments • Review of communications with third parties, as required • Legal support regarding claims and disputes, as required
OPG Procurement	OPG Project Director	• Support to all procurement activities required for project execution • Definition of applicable OPG Procurement Policies and strategies for the Project • Receives proposals (Phase 1) • Coordinates preparation of proposal evaluation criteria (Phase 1) • Participates in proposal evaluations (Phase 1) • Supports negotiation of tunnel contract (Phase 1) • Administers OR contract • Issue amendments to purchase orders • Contractual support in the management of all contracts • Business and commercial support in the evaluation and resolution of claims
OPG Finance – Financial Modelling	OPG Project Director	• Conduct financial modeling/evaluations, as required • Participate in proposal evaluations (Phase 1) • Support the preparation of project Business Case Summary for OPG Board approval (Phase 1) • Evaluate financial aspects of proposed project changes

Table 9.2 – Key Roles and Overview of Responsibilities

Position or Function	Reports To	Overview of Responsibilities
OPG Finance - Other	OPG Project Director	• Establish and maintain Project in SAP system • Review/audit of project cost data in SAP system • Identification of internal reporting requirements • Apply Goods Receipt status for payment of invoices approved by project team • Provide/facilitate input/advice on Finance related matters (e.g., insurance, taxes, credit, bonding etc) • Material and services requisitions
OPG Real Estate	OPG Project Director	• Identification of real estate acquisition requirements for the Project • Negotiation and acquisition of real estate required for project execution • Provision of legal surveys and property plans
OPG Risk Services	OPG Project Director	• Prepares project Risk Register (Phase 1) • Supports and reviews maintenance of Risk Register and Risk Management Plan • Provides risk-related advice to project team
OPG Public Affairs	OPG Project Director	• Develop and implement plans for project related communications to the public and OPG employees • Coordinate response to major public/media inquiries in consultation with NPG and OR • Organize public events in consultation with NPG and OR, as needed

10 Authority Levels

Through the Project Charter and OPG's Organizational Authority Register (OAR), the Project Director is authorized to approve project in-scope expenditures, and to commit OPG, in discussions/negotiations with regulatory agencies and other stakeholders with respect to satisfying the EA Conditions of Approval.

The relevant authority levels in OPG's OAR are as follows:

	Board	CEO	EVP	Vice President (Project Sponsor)	Director (Project Director)
Forecast project cost over-variance	>$25M	$25M	$15M	$4M	$1M
Purchase Requisitions within approved budget	N/A	>$25M	$25M	$8M	$4M

OPG has determined that the OR should have zero authority level.

11 Schedule and Milestones

There are certain key target dates set for the successful execution of the Niagara Tunnel Project.

These key targets are listed below:

Activity	Target Date
Phase 1	
Issue Expression of Interest Documentation	July 21, 2004 (Actual)
Receive Expressions of Interest	August 26, 2004 (Actual)
Issue Proposal Invitation Documents	December 22, 2004 (Actual)
Receive Tunnel Design/Build Proposals	May 13, 2005 (Actual)
Board approval	July28, 2005 (Actual)
Tunnel Contract Start Date	September 1, 2005
Phase 2	
Tunnel Contract Substantial Completion	October 9, 2009
Tunnel Contract Final Completion	December 8, 2009
Project Completion and Closeout	January 2010

Summary Schedule

Description	2004	2005	2006	2007	2008	2009	2010
Issue EOI Docs	•						
Receive EOI	•						
Issue Proposal Invitation Documents	•						
Receive D/B Proposals		•					
Board Approval		•					
Award Tunnel Contract		•					
Tunnel Contract							
Outlet Canal Construction							
Intake Construction							
TBM Tunneling							
Install Tunnel Lining							
Outlet Structure Construction							
Outlet Plug Removal							
Intake Cofferdam Removal							
Tunnel Contract Substantial Completion						•	
Project Closeout Phase							
Project Completion							•

12 Project Cost Estimate

12.1 Cost Breakdown Structure

The cost breakdown structure (CBS), establishes a systematic, hierarchical approach for identification of all the work elements in the Project. The CBS for the Niagara Tunnel Project provides a logical breakdown of the work and retains flexibility to accommodate adjustments to the Project configuration. The Project schedule incorporates the CBS providing the linkage between the work elements and the periods during which the work elements will be executed.

The CBS is composed of a hierarchical arrangement of elements having superior and subordinate elements as follows:

- Level 1 – Project Summary
- Level 2 – Area Summary
- Level 3 – Work Element or Package
- Level 4 – Component
- Level 5 – Activity.

Exhibit 12.1 illustrates a summary CBS to Level 3 with Level 4 added for the Design/Build Agreement only.

12.2 Cost Estimate (Phase 1)

The Cost Estimate for the Niagara Tunnel Project (the release quality estimate) followed the CBS described above.

The Project Controls Manager sought input from the entire Project team in their particular areas of expertise in order to assemble the cost elements forming part of the estimate.

The Cost Estimate incorporates the Design/Build Agreement fixed price from the successful proponent and all other costs have been estimated to fit the requirements of that particular proposal.

As part of its proposal, the Design/Build Contractor is required to deliver a schedule of values breaking down the fixed price in keeping with Level 4 of the CBS.

An appropriate level of contingency was added to each area cost total. This level reflected the quantitative risk analysis for the Project, as well as the experience of Project team members.

The Cost Estimate will be in a monthly cash flow format by CBS.

When completed, and approved by the OPG Project Director, the Cost Estimate (including contingency) was put forward for approval and acceptance by the OPG Board as the Approved Project Budget. This now defines the upper limit cost for completion of the Project scope within the Project schedule.

The Project Cost Estimate includes a statement of the following parameters:

- current status or phase
- estimate type
- purpose of the estimate
- basis of the estimate
- assumptions, constraints and known risks
- summary of the estimate value.

There was also a clear statement of the intent and purpose for which the estimate has been prepared. This information was used during the approval process to ensure that the estimate was not being approved for a purpose that was different from the intended purpose.

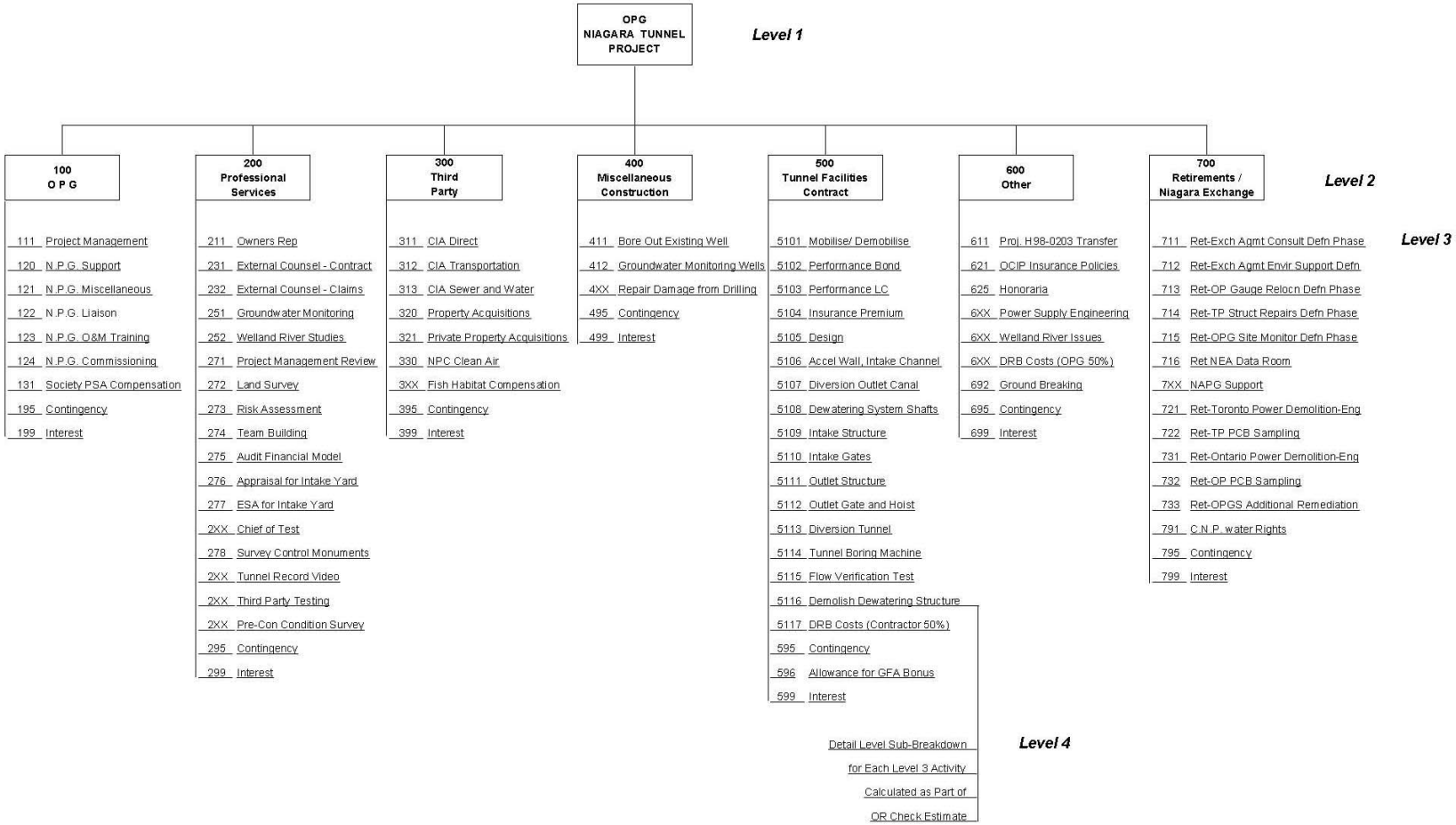
The basis of estimate documented directly, or through reference to other documents, the

- scope of work at a high level
- major deliverables
- cost breakdown structure
- execution, procurement and contracting strategies
- information sources
- estimate methodology and degree of accuracy.

The basis of estimate also noted any specific inclusions or exclusions to the estimate.

The summary of estimate provided a cash flow and total estimate information for each major work package or cost. In each case, the amount of contingency funds was denoted.

Exhibit 12.1 – Cost Breakdown Structure



Note: Retirements are addressed in a separate PEP.

13 Project Controls and Reporting

13.1 Overview

Effective Project controls systems and processes that provide accurate and timely information regarding the Project timeline and cost performance are essential for Project success. To that end, the Project team will employ a suite of current software tools and have in place a set of procedures that clearly define the requirement of the Project controls process.

OPG employs SAP as its enterprise-wide financial accounting system and it will be the source of all payment information. It is critical that the transfer of data between the Project controls system and SAP is timely and automated, if possible, to avoid duplication and error.

While appropriate computer tools are essential to efficient Project controls, they are no substitute for experienced project management staff who should have the skills to deliver effective controls even in the absence of such tools and who are ready to question the apparent output from the use of such tools.

13.2 Schedule Management

Schedules will be produced in three levels of detail as follows:

- Level 1 – Milestone Schedule by OR
- Level 2 – Overall Project Schedule by OR
- Level 3 – Production Schedules by Contractors.

Internal OPG Project schedules will contain an appropriate degree of contingency or "float" in keeping with that applied to the Project cost estimate in Section 12.2.

13.2.1 Project Schedule (Levels 1 and 2)

- The overall Project Schedule was prepared by the OR in Primavera P3 format to define the overall Project prior to receipt of the Contractors' schedules.
- All milestones and the critical path(s) were clearly identified.
- The schedule shows sequence and interdependencies of all major activities including approvals, designs, procurement, construction, etc.
- Once the tunnel Design/Build Contractor was selected, the Project Schedule was revised to reflect its proposed schedule.
- Approval/acceptance of the Project Schedule (baseline as part of Business Case and any substantive changes) will be by the OPG Board of Directors.
- The Project Schedule will be updated and revised monthly, or at major events or occurrences, to accurately reflect and report progress.
- Schedule issues will be tabled and discussed at regular team progress meetings. Comments will be tabulated for updating the schedule. The Project team will review the Contractor's proposed recovery action plans to best achieve original goals if schedule slippage occurs.

13.2.2 Contract Schedules (Level 3)

- An initial 90-day schedule and, subsequently, a full contract schedule, will be submitted by the Design/Build Contractor in Primavera P3 format.
- Contract schedules must represent a practical plan to complete the Work within the required milestones and completion dates.
- Approval/acceptance of Contract Schedules will be made after review by the Project team.
- Contract Schedules will show the sequence and interdependence of all tasks required of the contractor or consultant.
- Contract Schedules will be reviewed for compliance with the Design/Build Agreement by the Construction Manager and by the Project Controls Manager.

13.2.3 Current Schedules (Level 3)

- A copy of the Contract Schedules will be reviewed weekly and updated monthly by the Contractor as Current Schedules.
- The Project Controls Manager or his delegate will compare the monthly current schedules to Contract Schedules and Project Schedule and highlight variances impacting Project goals.
- Where such Project goals are negatively impacted, the Project Manager, in keeping with the terms and conditions of the Agreement, will require contractors and consultants to submit a detailed recovery plan along with a recovery schedule by the date of the next monthly update.
- The Schedule Performance Index (SPI) will be calculated and reported monthly.

13.3 Cost Management

Costs may only be expended on the Project when budgeted amounts including contingencies have been authorised by the OPG Board and a corresponding amount less contingency has been committed or released by way of a contract award or purchase order. No work will be permitted without these two controls.

13.3.1 Project Cost Estimate

- The baseline or "budget" for Project Cost Management will be based on the approved Project Cost Estimate (release quality estimate) discussed previously in Section 12 of this document.
- The goal of successful Project Cost Management is to deliver the whole scope of the Work within that budget.
- The comparison of incurred costs and projected costs will be made to Level 3 of the Project Cost Estimate.

13.3.2 Authorisation for Expenditures

- Budget amounts are authorised for expenditure by package, i.e., by intended Contract or Purchase order as broken out by the Project team.
- In preparing package budgets for authorization, the appropriate amounts of contingency and escalation will be included.

13.3.3 Committed

- Funds are Committed when Contracts are awarded or Purchase Orders are issued, or in the case of OPG internal work or third party costs, when costs are posted or cheques are issued, respectively
- Actual purchase orders and contracts will be net of contingency.

13.3.4 Incurred Costs

- The basis of reporting costs will be when they are "incurred". That is when OPG's liability is created.
- Incurred costs will be collected and tabulated monthly by the Project Controls Manager, and unpaid commitments will be recognized by OPG as accruals.
- The tabulated costs will be reported against individual package budgets.
- The Cost Performance Index (CPI) will be calculated and reported monthly.
- Estimated final costs will be calculated monthly or at major occurrences and these will also be compared to package budgets.
- Areas of concern will be identified for the immediate action of the Project team.
- Overall budget trends will be identified. If the overall Project Budget is in danger of being exceeded, an action plan will be developed to adjust the scope of as yet uncommitted packages to bring it back in line. Conversely, if there is certainty that there will be a considerable underrun, previously omitted scope may be revisited and re-assessed. Such potential scope adjustments will be referred to the OPG Board for approval.

13.3.5 Invoice Processing

- All Applications for Payment will be marked to the attention of OPG Accounts Payable and delivered electronically to OPG.
- With the exception of the OR Contract and other consultants/contractors engaged directly by OPG, all Applications for Payment will be submitted in draft form to and reviewed by the OR.
- The Project Director will review OR invoices.
- All Applications for Payment will be based upon the progress to date and, if applicable, on any schedule of values in the applicable Contract.
- All invoices after review and approval by the OR will be submitted to OPG and OPG will follow its current practices for payment along with any that may be specific to an individual contract.

13.4 Change Management

The goal of change management or configuration management is to ensure that the overall configuration of the Project does not change without a systematic review and approval of the proposed changes. Where changes are adopted, it is important to recognize their effect on all elements of the Project across its life-cycle including physical form, function, reliability and cost effectiveness, as well as the impact on the capital budget Project schedule and the Project risk profile.

13.4.1 Change Control Procedures

- No change will be made to the price, scope or terms and conditions of any Contract or Purchase Order without compliance with the formal review process hereunder.

- All discrete Changes in Phase 2 exceeding a value to be set by the Project Director, or changing any other terms or conditions of the Contract (or PO) Documents, shall be referred to the Project Change Control Board for review, potential revision and recommendation of approval, before proceeding to the person or entity having appropriate authority level for such approval.
- All discrete Changes under the above value, and not changing any other terms or conditions of the Contract (or PO) Documents, shall be reported to the Project Change Control Board at the first convened meeting after they have been approved and issued by the person or entity having appropriate authority level for such approval.

13.4.2 Change Control Board

- The Change Control Board (CCB) will consist of
  - OPG Project Sponsor
  - OPG Project Director
  - Project Manager (Chairperson)
  - Project Controls Manager
  - other ad hoc specialists as requested from time to time by the chairperson.
- All meetings of the CCB shall require a quorum of three members. In the planned absence of any regular board member, such member shall delegate their duties and responsibilities to an appropriate alternate while preserving the OPG/OR percentage representation.
- The CCB will meet at a regular frequency determined by the chairperson after consultation with the other members.
- Extraordinary meetings may be convened by the chairperson, after consultation with the other members of the CCB, on a Change Initiation which may otherwise cause a potential delay to the Project.
- A Project team member proposing a change is required to present its proposed Change in person to the CCB.
- The CCB shall issue approved minutes and logs of its proceedings.

13.4.3 Initiation Of Changes

- Changes (Project Change Directive/Amendment) can be initiated by any Project team member either on behalf of their own discipline or on behalf of a contractor (Contract or Purchase Order) who has formally requested same through a Project Change Notice.
- Change Initiations (CI) shall be presented to the CCB in the appropriate written format (to be set by the Project Controls Manager). CIs will contain
  - A copy of the Project Change Notice or Proposed Change Directive
  - a detailed description of the proposed Change
  - the reason for the proposed Change
  - the impact of the Change on physical form, function, reliability and cost effectiveness
  - the consequences of no Change
  - the total capital cost impact to the Project of the proposed Change (including OPG, OR, other consultant and other contracts' costs). Cost estimates should be based on contractor/consultant quotations. Any negotiations with the Contractor or Consultant to arrive at this price will be clearly stated by the Project team representative to be "**subject to**

OPG approval". Any contingency amount included in any estimates shall be clearly shown.
  - any life-cycle cost impacts
  - any schedule impact from proposed Change.
- If given recommendation of approval by the CCB, and endorsed as such by the signature of the chairperson on the formal CI document, the proposed Change (Project Change Directive/Amendment), accompanied by the approved CI, can proceed to the appropriate OPG person having the required authority level for such approval and execution.
- If approval is withheld for any reason, the CCB will give clear direction on what further course of action is required.

13.4.4 Project Change Directives

- Where the value of the Change does not require CCB recommendation of approval and there is no change to the terms and conditions of the Contract (or PO) Documents, a Project Change Directive (CD) can be issued at source by a person having appropriate authority without referral to CCB.
- CDs shall be formalized on a standard CD template as per Appendix 1.1(hhh) of the Design/Build Agreement.
- Any expected adjustment to the Contract (or PO) Price and the Contract Schedule will be clearly shown.
- Any change to the scope of the Contract or Purchase Order will be described in sufficient detail to be indisputable.
- Any changes to other terms or conditions of the Contract will be stated clearly and in detail. Any such changes will require sign-off by OPG Law Division.
- Project Change Directives will be signed by the person or entity in OPG having the appropriate level of signing authority.
- All parties involved in issuing a Project Change Directive must exercise extreme caution and proceed (after the required consultation) with the knowledge that such a document could commit and bind OPG to all consequential costs and impacts therefrom.

13.4.5 Amendments

- Amendments to the Contract shall be formalized on the template specified in the Design/Build Agreement as Appendix 1.1(b).
- The adjustment to the Contract (or PO) Price and the Contract Schedule will be clearly shown.
- Any change to the scope of the Contract or Purchase Order will be described clearly and in sufficient detail.
- Any changes to other terms or conditions of the Contract will be stated clearly and in detail, and will require prior sign-off by OPG Law Division.
- Contract Amendments will be executed by the Contractor/Consultant and by the Project Director on behalf of OPG and documented by an amendment (Instruction Notice) to the Purchase Order. The format of the IN shall be the OPG standard format.
- An updated Agreement document will be maintained by the OR incorporating all Amendments to date.

13.4.6 Non-Contract Changes

- For major scope changes prior to entering into a Contract or Purchase Order, a process will be followed similar to the above.

13.5 Progress Monitoring and Status Reporting

- The main interval for all progress monitoring and status reporting will be weekly, rolled up into monthly.
- Report formats and content will be developed progressively up to the award of the Design/Build Agreement and the issue of the first monthly report.
- Estimated Final Costs and cash flows of all Contracts and Purchase Orders will be recalculated monthly.
- All Schedules will be updated monthly.
- Distribution lists for weekly and monthly reports will be developed by the OPG Project Director.

13.6 Claims Management

- Any notice of claim for additional payment or extension to the Contract Schedule received from any contractor or consultant will be formalized on the standard Project Change Notice set out in the Design/Build Agreement as Appendix 1.1(iii). It will immediately be referred to the members of the Change Control Board and the CCB chairman will convene a special meeting if necessary or otherwise place it on the agenda of the next regularly scheduled meeting to discuss all options and recommend an appropriate course of action. This may result in referral to the Disputes Review Board (DRB).
- No claims will be referred to the DRB without prior CCB review and recommendation.
- Small claims not exceeding the threshold values in Section 13.4.1 may be settled at source without referral to the CCB.
- The Project Controls Manager will maintain a log of all such claims or potential claims along with the CCBs recommended course of action or rebuttal and will monitor all further progress in the matter.
- A review of all outstanding claims on the log will be a regular agenda item of the CCB.
- Tracking and discussion of all claims or potential claims will be included in the Project monthly report.
- Tracking and discussion of claims status will also be a regular item for progress meetings with the Contractors.

14 Risk Assessment and Risk Management

14.1 Overview

Subsurface undertakings such as the Niagara Tunnel Project generally face significant technical and other challenges during their planning, design, construction and operational phases. Systematic identification, analysis and effective management of the myriad of risks associated with this Project are critical to its successful outcome. A formal risk assessment process also enables informed communication with project stakeholders such as owners, funding partners, insurers, designers, contractors, insurers and the regulatory authorities, with regard to issues and expectations.

Effective risk management also facilitates more cost-effective project execution by allowing determination of the most appropriate strategies for responding to project risks and identifying opportunities. These risk response strategies generally fall into four categories as follows:

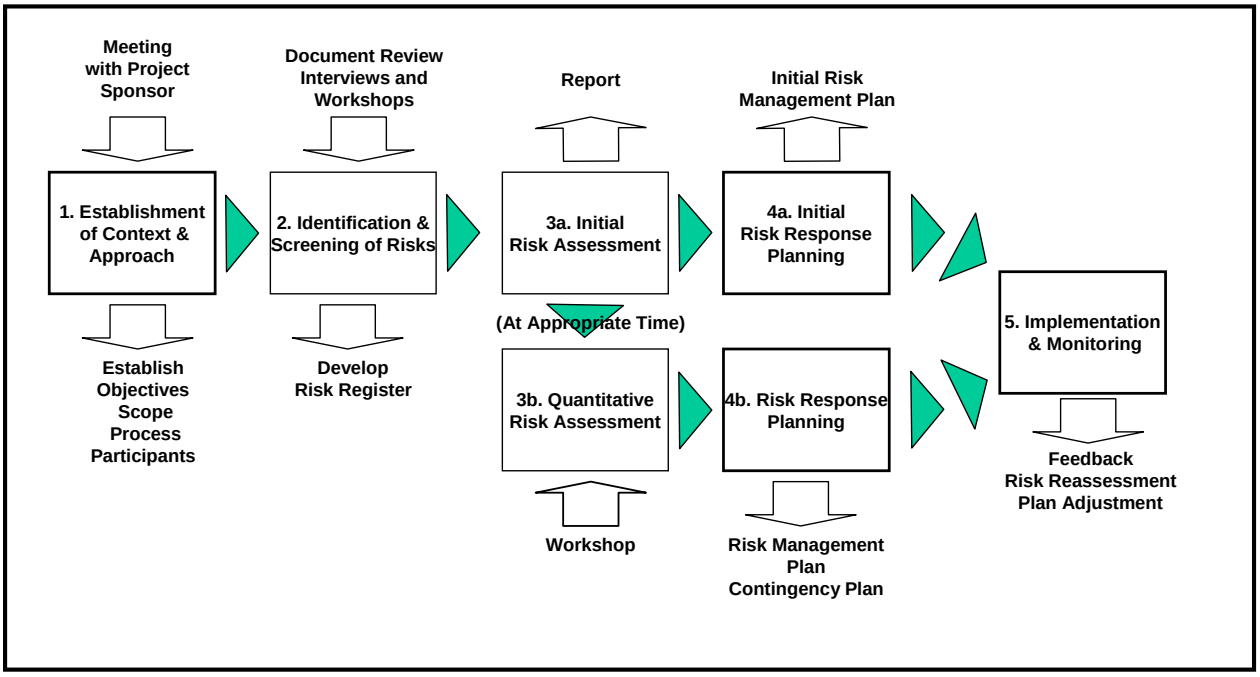
1. **Avoid Risk** – abort the undertaking or specific elements of the undertaking, design out risk or determine alternative methods to carry out the undertaking
2. **Reduce/Mitigate Risk** – re-design to reduce impact and establish control and monitoring programs to minimize risk of occurrence
3. **Transfer Risk** – Insure risk or transfer, wholly or partially, through contractual allocation
4. **Retain Risk** – to the extent that the above three alternatives are impractical or not cost-effective, identify the residual risks that are being retained and establish appropriate project contingency for cost and schedule

A qualitative risk management approach enables informed decisions with respect to Items 1 to 3 above. In order for the uncertainties associated with the project's cost and schedule estimates to be fully understood and enumerated, the risk management plan must be extended to include a quantitative risk assessment which numerically examines risk probabilities and potential consequences.

The key elements of a structured risk management program are listed below and shown in Exhibit 14.1

1. establish the basis for proceeding with risk assessment
2. Identification and Screening of Risks – Risk Register
3. Analysis of Risks
4. Formulation of a Risk Response Plan
5. implementation and monitoring.

Exhibit 14.1 – Risk Management Program



14.2 Responsibilities

OPG determined that the Project Sponsor would retain a suitably experienced consulting firm independent of the project team (OPG staff and OR staff) to achieve objectivity in the initial risk assessment. This was particularly critical given the short time frame before the invitation for proposals were released and because the specific technical risks were not typical in the usual course of OPG's business. The initial project readiness review and independent risk assessment was overseen by OPG's Risk Services in collaboration with other corporate oversight functions.

Key responsibilities for the five elements identified in the previous section may be summarized as follows:

Element 1 – Establish Risk Basis	OPG Enterprise Risk Management
Element 2 – Identify Risks/Develop Qualitative and Quantitative Risk Register	Independent Consultant
Element 3 – Risk Analysis and Simulation	Independent Consultant
Element 4 – Risk Response Plan	OR ProjectManager
Element 5 – Implementation and Monitoring	OR Team

14.3 Methodology

The key elements of a risk assessment program are described below.

14.4 Phase 1 – Procurement of Design/Build Contract

14.4.1 Establishment of Basis or Context

The scope, objectives and key evaluation criteria for the initial risk assessment were proposed by OPG Enterprise Risk Management and agreed to by the project sponsor.

The project areas to be examined and an initial list of risk areas were determined at an initial meeting. These risk areas included the following:

1. Regulatory/Approvals/Permits
2. Stakeholder Issues
3. Planning and Design
4. Financial/Commercial/Contractual and Procurement
5. Logistics/Access
6. Construction
7. Environmental
8. Safety and Security.

14.4.2 Risk Identification and Screening

A number of workshops were held to qualitatively identify, characterize, rank and evaluate risks and opportunities.

Risk workshops, utilized a facilitator, provided a structured approach to identifying risks, and determined their probability of occurrence and potential impacts. The workshop was facilitated by OPG Risk Services and the independent risk assessment and peer review consultant.

Probability and consequence criteria used in the workshop were developed prior to the workshop and confirmed by workshop attendees. A risk ranking or decision matrix was utilized to obtain an initial ranking of the identified risks and to screen out those risk that do not warrant detailed quantitative analysis.

A qualitative risk register was created at these workshops, which included a list of key project risks, preliminary assessments of probability and potential consequence, and preliminary mitigation plans.

14.4.3 Risk Analysis

A quantitative risk assessment was then completed after additional workshops were conducted to collect data for analysis (see Item 3b in Exhibit 14.1). The data were used to help determine probability and consequence parameters to derive probability curves for project cost and schedule outcomes for purposes of determining contingency requirements for project cost and schedule.

14.5 Phase 2 – Design and Construction

14.5.1 Risk Response Planning

During the implementation phase of the Project, a risk management plan will be developed by the OR based on the initial risk assessment. The plan will identify key risks and a strategy and methodology for management of these risks. The risk management options, discussed earlier in this document include risk avoidance, reduction, transfer and risk retention (contingency). Each decision will be reviewed to determine if it would create or result in a secondary or residual risk, which must be addressed in the risk management plan.

The Project insurers have directed that OPG and the Design/Build Contractor establish a combined approach to risk management. Therefore, a key objective during this phase is to ensure the Owner's risk response plan is coordinated with that of the Contractor, which was developed separately during the proposal stage of the project.

14.5.2 Implementation, Monitoring and Feedback

Based on the risk management plan, a monitoring program will be implemented to track how project risks are being addressed and to provide feedback to identify necessary adjustments to the risk plan. Joint systematic monitoring of the project and the risk management plan by the OR and the Contractor be carried out to determine the effectiveness of the approach and to determine the need for modification of the plan.

The OR will provide ongoing review and management of the risk management program. If required an independent third party could be retained during the course of the project for periodic project review and oversight.

15 Engineering Management Plan [Design/Build Contract only]

15.1 Overview

OPG/OR has elected to execute the Project through a Design/Build contract, meaning that the Contractor is responsible for the design of the Project, with OPG reviewing such design for compliance with prior Submittals and contractual obligations. OPG requires engineering support from the OR in both phases of the project. For Phase 1, the OR engineering support consisted of

- preparation of the Owner's Mandatory Requirements and other technical schedules to the Design/Build Agreement
- preparation of the GBR-A and negotiation of the GBR-C
- support in preparation of the Design/Build Agreement and other contracts
- input and support for various studies and engineering activities, e.g.,
  - St. Davids Gorge
  - hydraulic optimization and power and energy studies
  - third party issues
  - other support as required
- technical review of bids and proposals and recommendations
- support in negotiation of Design/Build Agreement
- management and engineering support to miscellaneous third party contracts.

Phase 2 engineering support will, as a minimum, consist of

- submittal review scheduling and manpower allocation
- review of Contractors' submittals and additional engineering to support such reviews
- support to OR site staff on issues related to construction quality and contractual compliance
- geotechnical support to OR site staff
- assistance on site as required.

The majority of the OPG engineering requirements for Phase 2 of the work will consist of technical review of Contractors' submittals. Once the submittal schedule is known, a comprehensive and fully detailed plan, including staffing requirements to meet the submittal schedule, will be developed. The plan will include additional engineering requirements to support the review process which could, for example, include independent analysis of the tunnel lining system, hydraulic analysis of the conveyance system, structural checks of various components and geotechnical analyses.

Further detail and planning will be required once the Contractor's engineering plan and submittal schedule is provided by the Contractor.

15.2 Submittal Requirements

The Contractor is required to submit a large number of documents to support its design. Due to the volume of submittals and the complexity of the Work, it is critical to establish a clear plan for reviewing this documentation.

In Phase 1, each proponent contractor submitted the following key submittals with their proposals. Following selection of the Contractor, such submittals have been included as appendices to the Design/Build Agreement:

- Design Basis Document
  - codes and standards
  - layouts and general arrangements
  - conceptual design solutions, loadings and preliminary calculations
  - construction methodology, sequencing, etc
  - equipment and material specifications
- GBR-B
- Outline Specifications
- Draft Drawings
- TBM Description.

In Phase 2, the Contractor is required to submit the following key submittals:

- 90-day and detailed engineering/construction schedules
- Final Design Basis Document
- 100% Construction Documents
  - detailed construction drawings
  - detailed construction and material specifications
  - checked engineering analysis and design calculations
  - minutes of the Contractor's design review meetings
  - other supporting documentation
- Construction Methods
  - environmental protection procedures
  - QA/QC plans and procedures
  - specific method statements
- As-Built Design and Drawings
  - construction drawings with all 'as-built' information
  - specifications to reflect 'as-built' condition
  - checked design calculations for revisions to the 100% Construction Documents.

Additional submittals are also required for certain elements of the work as defined in the Design Build Agreement.

15.3 Review of Contractor Submissions

Each Contractor submittal will be reviewed against, at a minimum, the criteria set out in Table 15.1, as applicable, in descending order of precedence.

Table 15.1

Information	Author
Applicable Laws	various
The Design/Build Agreement	OPG
Owner's Mandatory Requirements	OR
Design Basis Document, Drawings and amendments	Contractor
Owner's Representative's confirmatory design review	OR
Other related and reviewed Contractor submittals	Contractor
Other supporting information as provided by or requested of the Contractor	Contractor

Submittals will be reviewed by the OR in sufficient detail to verify that they are in general conformance with the criteria set out in Table 15.1. The review of the submittals will be performed by an individual who is generally knowledgeable of the project requirements, applicable codes and standards, and requirements/commitments of previous submittals. All submittals will be reviewed by an appropriate discipline professional qualified in the area requiring the review. Each submittal may be reviewed by more than one discipline professional. The Project Engineering Manager is responsible for designating who will carry out such reviews, and the reviewer is responsible for carrying out the review in accordance with project requirements. Review will generally not extend to means, methods, techniques, sequences or procedures of construction or to related safety precaution or programs, other than for compliance with the Design/Build Agreement. Some detailed designs must also be reviewed by OPG/NPG, specifically those pertaining to intake and outlet gates, hoists and associated systems, including operation, maintenance and handling aspects.

Review of a submittal by the OR does not relieve the Contractor from its contractual obligations regarding design, fabrication, construction, erection, suitability for purpose, and warranties under the Design/Build Agreement. Signing off a submittal as "Reviewed" means that the submittal becomes a "Final Submittal" which will be deemed to be incorporated into the Design/Build Agreement.

Comments resulting from the review of the Contractor submittal will be marked on the submittal and signed by an authorized signatory in accordance with project procedures. The authorized signatory means the qualified professional designated by the Project Engineering Manager to sign the submittal review stamp. The authorized signatory and others engaged in the review of the Contractor's submittals will observe the following guidelines while reviewing submittals:

- the OR is not the Contractor's checker. Submittals with excessive errors will be rejected and the Contractor reminded of its contractual obligations
- the review is performed expeditiously within the contractual timeframe so as not to jeopardize the delivery schedule
- the review is not an approval of the Contractor's design, the accuracy, completeness, details or dimensions of the submission, or the means, methods, techniques, sequences or procedures of construction and does not relieve the Contractor of its contractual responsibilities

- no notes or comments are to be placed on the document which could be interpreted as an approval of anything other than general conformity with the criteria set out in Table 15.1
- if clarifications or interpretations are required from the Contractor to properly review the submittal, only written information is acceptable; verbal information must be confirmed in writing.

After all comments have been consolidated, the authorized signatory will tick off on the submittal review stamp one of the following categories, as appropriate, and will date and sign in the space provided on the stamp:

- **Reviewed as Submitted** – to be used when there is no comment on the submittal
- **Revise as Noted** – **Do Not Resubmit** – to be used where comments on the submittal are minor and do not affect the Work and there is no need to delay the Contractor in proceeding with its work
- **Revise and Resubmit** – to be used when there are inadequacies in the submittal which require correction and resubmission for further review. Whenever possible, comments will be made directly on the documents submitted.
- **Review not Required** – the submittal is not directly related to or it does not form part of the completed work
- **Not Suitable for Review – Resubmit** – submittals may be returned to the Contractor if the submittal is not suitable for review and does not meet the basic requirements for such submittal.

A copy of the reviewed and signed submittal will be retained in the project file and the original returned to the Contractor. Submittals that no longer require review will become "Final Submittals" and will form part of the Design/Build Agreement.

16 Construction Oversight, Installation and Commissioning Management Plan

16.1 Construction Overview

The project consists of three primary components, namely, the Intake Works, the Outlet Works and the approximately 10-km long Diversion Tunnel. The EA dictates that the tunnel will be driven by a tunnel boring machine (TBM) from the Outlet to the Intake.

Construction of the Outlet Works and Diversion Tunnel will be performed from the same location within OPG property in the vicinity of the existing OPG Pump Generating Station (PGS). Excavated spoil will be disposed on OPG property between the existing canals.

The Intake Works will be constructed from a separate work area in the Niagara River adjacent to the INCW structure with a lay down area on neighboring lands owned by Niagara Parks Commission. Excavated spoil from the Intake Works will be trucked to a suitable location for recovery of material suitable for reuse as aggregate.

The tunnel will be constructed by means of a two pass tunneling technique. The first pass includes bored excavation by a 14.4-m diameter open gripper TBM and installation of primary (initial) lining from the TBM trailing gear. The primary lining will vary along the tunnel length, depending on rock conditions encountered but will generally consist of a combination of rock bolts, steel mesh, structural steel ribs and shotcrete. The second pass, after completion of bored tunneling, will include installation of a double waterproof membrane, and either 600 or 700 mm (required in Queenston Shale) cast-in-place concrete lining and pre-stress grouting of the lining.

The following suppliers and key subcontractor have been retained by the General Contractor

- the Robbins Company from Ohio, USA for design, manufacture and delivery of the open gripper TBM
- ROWA out of Switzerland for design, manufacture and supply of the TBM trailing gear and equipment.
- Dufferin Construction for construction of all “outside works” (i.e., nontunnel) including Intake and Outlet site layout and temporary works, and excavation and construction of the Intake and Outlet structures.

In terms of Occupational Health and Safety Act (OH&SA), the Contractor will be designated as Constructor for the project except for at the INCW Part Project where the Owner, represented by the OR, will be designated as Constructor in terms of a Part Project.

A certain amount of preconstruction enabling work was completed. This included

- implementation of a Groundwater Monitoring Program
- right of way survey
- installation of Survey Control Monuments
- roadworks
- provision of sewer and water connection stub-ends.

After completion of the tunnel, flow testing will be carried out by Alden Laboratories, a mutually accepted and internationally renowned hydraulics testing company who will perform the joint function of tester and Chief of Test.

16.2 Construction Oversight, Installation and Commissioning Management

16.2.1 Organization

Exhibit 9.5 shows the Phase 2 organization of the project team.

Daily construction monitoring will be provided by a site-based OR team led by the Construction Manager reporting to the OR Project Manager alongside the Controls Manager, Engineering Manager and Environmental/Third Party Manager.

Designated teams will be responsible respectively for monitoring of the
- Intake and Outlet Works
- Diversion Tunnel
- TBM manufacturing facility
- Trailing gear manufacturing facility
- gate and hoist manufacturing facility.

Monitoring staff will be provided to ensure coverage of all construction shifts. In particular, monitoring of TBM tunnelling and cast-in-place concrete lining will be provided on a full-time basis during each and every tunnel production shift.

In terms of the Design/Build Agreement, on-going concurrence is required between OPG/OR and the Contractor on the rock conditions actually encountered during bored tunneling as they relate to rock support. Provision is made in the Design/Build Agreement for adjustment of each of schedule and price in the event that actual rock conditions encountered vary more than 5% in the aggregate from those baselined in the Geotechnical Baseline Report. A team of geologists in collaboration with the senior geotechnical engineer on the OR Engineering Team will be responsible for the daily review and classification of encountered rock conditions to enable ongoing concurrence with the Contractor, and also to record rock conditions for potential disputes other than those related to rock support.
A primary site office will be established in the site office compound at the Outlet Works and a satellite office will be provided at the Intake Works. Management of the site office will be the responsibility of the OR.

16.2.2 Key Tasks

The Construction Management team will be responsible for the following key tasks:
- Health and Safety of OR's Staff
- Health and Safety as Constructor for the Part Project at the INCW.
- Health and Safety Audits for the Owner Only portion of the Project
- Contract Administration
- Construction Monitoring and Documentation
- Monitoring of material quantities baselined in the Geotechnical Baseline Report
- Coordination of Site-Based Submittals Review and Response to Contractor

- Constructability review of submittals
- Construction Quality Assurance Monitoring and Audit
- Claims Avoidance and Resolution
- Construction Progress Reporting
- Tunnel Survey and Alignment Audit
- Classification of rock conditions encountered and agreement with Contractor
- Reconciliation of final tunnel lengths in rock conditions encountered
- Monitoring of Factory Testing and Post-Installation Testing.
- Commissioning and Flow Testing
- Substantial Performance, Punch List and Final Completion.

In addition, the Construction Management Team will provide close support to the following OPG/OR activities:

- Project Controls
- Risk Management Plan
- Submittal Review
- Public Communications Plan
- Agency Interfacing
- Team Building
- Change Management
- Environmental Compliance
- Community Impact Agreement Provisions
- Contract Closeout.

16.2.3 Roles and Responsibilities

To ensure clear lines of reporting and responsibility, job descriptions have been developed for each site-based position identified on the organization chart.

16.3 Construction Schedule

A summary of key construction activities is summarized in Section 11.

16.4 Testing and Commissioning

16.4.1 Testing

Quality Control Testing
Quality assurance and testing will be the responsibility of the Contractor. The Contractor will prepare a Quality Assurance/Quality Control Plan for review by OPG. OPG, through the OR will audit the quality assurance program and the work for contractual compliance. OPG has maintained the right to engage independent testing agencies to assist in the quality audit.

Factory Testing
Contractor will conduct factory testing on various equipment and components of the work and will provide adequate notice and access to OPG/OR. This includes the TBM and associated

backup equipment. Factory testing will be monitored for purposes of payment certification and compliance with the Quality Assurance program.

Post Installation Testing
Post installation testing will be carried out on the TBM and associated backup equipment, Intake gates, including delivery and storage at designated location, Outlet gates, hoists and auxiliary systems, tunnel watering-up and instrumentation array monitoring. Post installation testing will be monitored for purposes of payment certification and compliance with the Quality Assurance program and Contractor's contractual obligations.

16.4.2 Commissioning

Commissioning of the Niagara Tunnel Facility Project will be carried out after achievement of substantial performance after the tunnel has been watered up. Commissioning will include

- progressing through startup and closing and opening sequences of the outlet gates
- flow testing for performance rating of the facility
- provision of operating manuals and training for operation and maintenance of gates, monitoring of instrumentation arrays and on-going groundwater monitoring.

A more detailed commissioning and turnover plan will be developed when a detailed construction schedule is submitted by the Design/Build Contractor.

17 Environmental Oversight Plan

The objective of the environmental oversight plan is to ensure
- all environmental Approvals are in place such that the overall project schedule is not affected
- construction activities are carried out in an environmentally acceptable manner to meet all EA and Approvals requirements/conditions.

17.1 Phase 1 Activities

Environmental issues addressed prior to Contract award involved
- advancement of certain outstanding environmental approvals
- assessment of the Outline Environmental Management Plan submitted by the Proponents.

As described in Section 7, a number of permits and clearances of Conditions of EA approval were required. Submissions to appropriate authorities were progressed to the extent possible without Contractor input. Specifically, the Department of Fisheries and Oceans compensation plan and monitoring plan requirements were advanced by the OR Environmental/Third Party Manager.

Criteria for the assessment of the Outline Environmental Management Plan were developed in consultation between OPG and OR Environmental/Third Party Manager. The components of the outline plan contain the items outlined in Section 17.2.

17.2 Phase 2 Activities

A detailed Environmental Management Plan will be developed by the Contractor after Contract award, based on the outline plan submitted by the Contractor. The Plan will have two components—protection and compliance. The components of the Plan identified as the Contractor's responsibility are a contractual requirement. It will be the OR's responsibility to audit the plan and ensure its implementation throughout the Project.

17.2.1 Environmental Protection

A number of elements for environmental protection identified in the Contractor's Outline Environmental Management Plan will be developed in detail in Phase 2 by the Contractor. These will include details in relation to
- Erosion and Sediment Control
- Stormwater Management
- Dewatering Plans
- Air Emissions/Dust Control/Mud Control
- Excavated Material Plan
- BTEX Management and Disposal Plan
- Transport Impact Management Plan
- Emergency Services Plan
- Spill Contingency Plan
- Solid/Domestic/Hazardous Waste Management
- Site Clearing Plan

- Blasting Plan
- Hazardous Material Handling
- Restoration Plan
- Groundwater Monitoring.

These elements will be the responsibility of the Contractor to develop and implement. The timing and responsibilities for development of these elements are identified in Table 17.1. A number of elements must be submitted and approved by the regulatory agencies prior to the commencement of construction. There will be overlap in the development of some elements and it will be the Contractor's decision as to whether to submit these as separate documents or to combine a number of them. The OR will be responsible for auditing the Work for compliance with accepted plans.

17.2.2 Environmental Compliance Program

A detailed environmental compliance program will be developed by the Contractor, based on the outline plan submitted with the proposal.

The program will identify all areas where compliance is required to meet

- commitments made in the EA document
- Conditions of EA Approval
- Conditions of Authorization under the Fisheries Act
- Community Impact Agreement commitments
- Certificates of Approval
- Permits and Authorizations
- environmental protection requirements identified above.

Components of the program which are the responsibility of the Contractor were clearly identified. All reporting requirements to OPG/OR and the Authorities having jurisdiction were outlined.

It will be the OR Environmental/Third Party Manager's responsibility to oversee the program and ensure that the reporting schedule is met, including submission of the annual compliance monitoring report to MOE, pursuant to the EA Approval (Condition 1.6) and any reporting to the Liaison Committee, pursuant to the Community Impact Agreement.

A protocol will be developed to address all complaints from the public. The protocol will require the concurrence of the Liaison Committee.

The program will be updated to incorporate any new conditions required as further permits/approvals are obtained.

Table 17.1 Environmental Protection

Environmental Protection	Responsibility for Documentation	Submission Date	Agency
1. Erosion and Sediment Control Plan (including in-stream work)	Contractor	Prior to start of Construction	NPCA DFO MNR
2. Dewatering Plan	Contractor	Prior to start of Construction	MOE (NPCA, DFO, MNR)
3. Stormwater Management	Contractor	Prior to start of Construction	NPCA
4. Blasting Plan	Contractor	Approval required prior to any in-water blasting Prior to on land blasting	DFO OR (City/Liaison committee)
5. Dust Control, including CofA (Air) Ventilation	Contractor	Prior to tunneling	MOE
6. Spill Contingency Plan	Contractor	Prior to start of Construction	OR/OPG
7. Transportation Impact Management	OR/Contractor	Prior to start of Construction	Regional Municipality of Niagara/City of Niagara Falls
8. Excavated Material Plan, including re-use	OR/Contractor (Reuse Committee)	Prior to start of Construction	MOE, RMON
9. Emergency Services Plan	Contractor	Prior to start of Construction	City of Niagara Falls/ Liaison Committee
10. BTX Management and Disposal	Contractor/OR	prior to start of tunneling	MOE
11. Solid/Domestic Waste Management	Contractor	Prior to start of Construction	OR
12. Hazardous Waste Management	Contractor	Prior to start of Construction	OR
13. Restoration Plan	Contractor	3 months prior to clean-up (?)	OR

18 Communications Plans

18.1 Communications Management

18.1.1 Communications Strategy

The strategy for addressing the need for effective communications concerning the Project is to develop two plans—one to handle public and OPG employee communications, and the other to handle internal project team communications. The former is being developed by OPG Public Affairs for approval by the OPG Project Director; the latter is being developed by the OR Project Manager for approval by the OPG Project Director.

18.1.2 Public and OPG Employee Communications

The overall purpose of public communications is to proactively manage public communications aspects throughout all phases of the Project. The goal of public communication is to build public support for the project and proactively deal with any public issues that arise.

OPG Public Affairs will develop a public communications plan which describes the communication activities to be undertaken to support the successful completion of the Project. This plan must be approved by the OPG Project Director. The plan entails use of a wide range of existing well-proven tactics focused on building community support through communication of significant Project milestones and ensuring effective response to any community impact issues as they arise.

An important focus will be to demonstrate that the Project is being well managed, e.g., meeting stated commitments on time. The plan will also include strategies to address unanticipated events, delays or other major changes to the project.

The OPG Project Director will oversee public communication activities.

The respective roles and responsibilities of the OPG Project Director, OPG Public Affairs, other OPG organizational units, the OR and the Contractor will be identified with respect to public communications.

The public communications plan will be made up of three components—public communications, OPG employee communications, and communications to support the Community Impact Agreement.

The goal of the public communications plan is to ensure timely and accurate notification of Project approvals, construction start, key construction milestones, and Project completion. Tactics consist of notification to affected communities and local media of project information and significant Project milestones, contact with local key stakeholders, interest groups and media to ensure that they are fully informed about the Project and have any questions answered quickly, quick response to media and public inquiries, and holding of public forums such as Open Houses if required. Typical examples of community notification will include

- media releases and/or suggested information articles for community newspapers
- newsletters to key stakeholders and communities adjacent to construction activities
- a frequently updated public website with project information.

A video record of the progress of the project will be made for public information purposes.

OPG employee communications will consist of articles in internal OPG publications and posting of frequently updated project information on OPG's internal website to ensure general OPG employee (and especially OPG Niagara Plant Group employee), knowledge, understanding, and support of the Project. Project information will be integrated with OPG employee wide news to optimize use of these existing resources. As well, there must be a mechanism (e-mail address) to ensure that employee questions and concerns about the Project can be easily communicated and responded to by Project staff.

Communications support for the Community Impact Agreement consists of any public communications in support of the municipal Liaison Committee, the implementation and monitoring of the citizen complaint procedure during construction, as well as any other communication activities required, e.g., to support municipal transportation management and tourism impact management plans as specified in the Community Impact Agreement. The citizen complaints procedure will be simple and responsive. For example, a telephone and e-mail 'hot line' that is monitored at least twice daily with immediate acknowledgement response and strict limits on timeframes for full response to issues raised by the public. A protocol will be established to direct all inquiries (and complaints) to appropriate Niagara Plant Group staff who will notify the OR for investigation and resolution of the issue with the Contractor.

In addition, Contractor is required to inform the local construction industry of potential project-related employment and supplier opportunities in line with the provisions of the Community Impact Agreement.

18.1.3 Project Team Communications

The OPG Project Director will coordinate communications between the project team and other entities, except the Contractor. The OR Project Manager will coordinate communications between the project team and the Contractor, and will establish a communications program and protocols for the internal project team and with the Contractor and subcontractors.

Open communication is essential for timely decision-making and efficient execution of this work. To facilitate accurate and timely information transfer, efforts of the Project Team will be coordinated and integrated to facilitate effective communication, thereby adopting a 'no surprises' approach to Project execution. Key elements include

- planning meetings, convened by the OR Project Manager (PM) as required, involving key Project team members to define the scope of work and establish baseline budgets and schedules for future work
- monthly progress meetings, convened by the OR Project Manager, involving key Project team members to review cost and schedule performance versus the baseline plan
- recap meetings, convened by the OR Project Manager at appropriate points to review lessons learned, and implement identified improvements

- Site coordination meetings (during Phase 2) at a frequency of not less than one per week, to review progress and plan upcoming activities.

Project team members from different disciplines and different organizational units will adopt the most effective interface method (email, telephone conferences, memoranda, small group discussions, etc) to ensure that the latest information (e.g., design constraints, environmental constraints, scheduling constraints, etc) is available to other Project team members whose work will be affected.

The following Rules of Conduct will apply to promote more productive meetings:
- meeting agendas must be prepared for all meetings and distributed in advance of the meeting to all invitees
- the focus of discussion will be weekly Project updates* and updates to the Action Tracking System database
- project meetings will begin at the scheduled time - latecomers will miss the start
- only one person will speak at any time - others will listen and not conduct side discussions
- it is acceptable to criticize ideas - but not to criticize people
- participants are encouraged to be frank and honest
- participants should stick to the topic at hand
- participants should keep an open mind
- the meeting chair is responsible for keeping the meeting on agenda.

*Weekly and monthly Project updates may be modified for use in keeping internal stakeholders up to date on Project progress.

Meeting Notes are required for all meetings to document the purpose, date, location, attendance, file number, summary of the discussion, summary of results, and summary of follow-up actions required. Action items identified at meetings will be issued to all Project team members to enhance the level of communications and understanding of the Project development. Meeting Notes should be prepared and issued by the meeting organizer within one week after the meeting (within two days, if possible). A copy of the Meeting Notes is to be filed in the Project Records Centre by the meeting organizer.

A password protected "FTP" website has been developed for project team use only, e.g., posting of update information.

Table 18.1 summarizes the Project communications requirements for Phase 1.

Table 18.2 summarizes the overall Project communication requirements for Phase 2.

Table 18.3 summarizes the protocols for internal communications.

18.2 Communications with Contractor

All communications with the Design/Build Contractor will be through the OR Project Manager or persons designated by the OR Project Manager.

18.3 Team Building

OPG proposed a voluntary team building program for the Project. The Design/Build Agreement identifies the Team Building Program as "a structured approach to improve communication between OPG and its representatives and the Contractor and its Subcontractors, and to facilitate problem solving, conflict avoidance, and issue resolution."

18.3.1 Objective

To maximize the effectiveness of each Project participant's resources to efficiently and safely achieve a quality end product, on time and within budget without unresolved disputes.

18.3.2 Principles for Project Team

Team building principles will be employed to develop productive working relationships and to encourage all project team members to be innovative and strive to reach their full potential. Team building principles to be employed include

- providing constructive feedback to team members
- following a cooperative work ethic at all times
- compromise and being creative in resolving differences
- providing clear team goals that are understood by all team members
- creating a team atmosphere of mutual respect, inclusion and trust.

OPG and OR Project team members attended an initial team building workshop on February 28 and March 1, 2005. The session was facilitated by an outside consultant.

18.3.3 Participation in Team Building by Contractor

The Contractor's participation in the team building program has been confirmed. It is anticipated that within 90 days after signing the Design/Build Agreement the Contractor's on-site Project Manager and OR Project Manager will develop a plan to hold a team building workshop to be attended by key staff of OPG, OR and the Contractor. Follow-up workshops, events, activities, etc, will be held periodically as agreed to by the Contractor and OPG/OR.

18.4 Confidentiality Agreements

Confidentiality Agreements will be signed with the OR and subcontractors working on behalf of OPG.

Table 18.1 – Project Communications Plan – Phase 1

Stakeholder	Information	Frequency	Methodology	Responsible
Board	o High level performance metrics o Key external issues	Quarterly	Meeting and Presentation Meeting Handout Board Memo	Major Projects Committee/Project Sponsor
Major Projects Committee	o High level performance metrics o Key external issues	Monthly	Verbal/Presentation/Board Memo	Project Sponsor/Director
Sponsor	o Cost, schedule , safety and quality reports o Issues/concerns and Actions	Weekly	Verbal Status Report	Project Director
Project Director	o Communications Report o Issues and Actions	Bi-weekly	One-on-one meeting	Project Manager
Project Team	o Cost and schedule metrics o Issues and Actions Report o Work ahead	Weekly	Team Meeting Minutes of Meeting	Project Manager
Approving Agencies	o Approvals status list o Approvals schedule	Bi-Weekly and Monthly	Minutes of Meeting	EA/Third Party Coordinator
Niagara Plant Group	o Technical documentation o Stakeholder issues	Weekly	Meeting	Project Manager

Table 18.2 – Project Communications Plan – Phase 2

Stakeholder	Information	Frequency	Methodology	Responsible
Sponsor	o Cost, schedule , safety and quality reports o Issues/concerns and Actions	Weekly	Verbal Status Report	Project Director
Project Director	o Communications Report o Issues and Actions	Bi-weekly	One-on-one meeting	Project Manager
Project Director	o Project report including cost/schedule/quality/ environmental/safety performance of project	Monthly	Report	Project Manager
Project Director	o Summary reports covering project activities and status action tracking list	Weekly	Report	Project Manager
Project Team	o Cost and schedule metrics o Issues and Actions Report o Work ahead	Weekly	Team Meeting Minutes of Meeting Action Items	Project Manager
Project Team/Contractor	o Design/construction report o Progress report	Weekly	Progress Meeting with Minutes and Action Items	Project Manager
Niagara Plant Group	o Technical documentation o Stakeholder issues	Weekly	Meeting	Project Manager
General Public	o Project status	Monthly	Project Website	OPG Public Affairs

Table 18.3 – OPG and Owner's Representative Internal Communications Protocol

Communication	Contact Person	Methodology
Formal Communications OPG to/from OR	OPG Project Director to/from OR Project Manager	Letter Email Fax
Request for work to OR staff	OPG Project Director to OR Project Manager	Letter Email Fax
Meeting Invitations	OPG staff to/from OR staff Cc to OPG Project Director and OR Project Manager	Email Letter Fax
Requests for information OPG to/from OR	OPG staff to/from OR staff Cc to OPG Project Director and OR Project Manager	Verbal Email Letter Fax
Project Coordination	OPG staff to/from OR staff Cc to OPG Project Director and OR Project Manager	Verbal Email Letter Fax
Cost and Schedule Information	OPG Project Director to/from OR Project Manager	Letter Email Fax

19 Records Management

During execution of the Niagara Tunnel Project, most project records will be kept at the Project Records Centre at the Hatch Acres offices in Niagara Falls. Exceptions to this will be confidential and legal documents that will be kept at OPG headquarters in Toronto. Upon completion of the Project, all Project records will be transmitted to the Niagara Plant Group Records Centre.

Documents and records are organized in accordance with the SCI system.

19.1 Data Room

A Data Room was assembled and open to prequalified proponents intending to submit a proposal for the Niagara Tunnel Facility Project. In compiling the material for the Data Room, OPG and its Representatives elected to make all available information, of which they are aware, that is potentially relevant to the Niagara Tunnel Project, available to proponents. The material in the Data Room represented work done since the 1980s by various parties. Proponents were advised of risk that material in the Data Room may have been outdated, irrelevant, inaccurate or incomplete.

The Data Room was located at the Project Records Centre in Niagara Falls. The OR Data Room Coordinator was responsible for developing Data Room operation procedures and for facilitating access to the Data Room for Proponents. All documents have been stored at the Project Records Centre in Niagara Falls.

19.2 Core Samples

The core samples are located at the OPG Niagara Transformer Station, 1900 Murray Street (at Main Street) in Niagara Falls, and are available for viewing by the Contractor. Visits can be arranged by contacting Peter Pahl, Telephone 905-357-6721, email: peter.pahl@opg.com.

19.3 Project Documents and Correspondence

All Project documents, including correspondence, Purchase Requisitions, Purchase Orders (including amendments), reports, drawings, bills of material and the like must include proper document numbers and must be provided for filing with Project Records Centre.

Project drawings will be produced following OPG drawing standards and will include an approved title block. Project drawings are to be produced in electronic format preferably using the latest approved version of Autocad.

Proper document numbers, include the Property Designation (NAW130), Document Type, SCI, Serial Number and Revision Number. The Niagara Plant Group Records Centre manages the assignment of document and drawing numbers.

Proper file numbers, including the following, must appear on all Project correspondence:

Property Designation **NAW130**
SCI (5-number code)..... **XXXXX**

Retention Period (T# = Temporary for # of years; P = Permanent)..... **T# or P**

The SCI number codes are hierarchical. The five digits represent the following hierarchy:

X .....Function
X.....Feature
X.....System
X.....Subsystem
X.....Component or Element

For Project correspondence, SCI numbers used should generally be limited to function, feature and system (first three digits), as appropriate, with zeros assigned for the subsystem and component digits. SCI numbers recommended for use on the Niagara Tunnel Project are noted below:

SCI Listing for Project Document Management

SCI #	Description	Correspondence	Reports	Drawings
00000	ADMIN and ENGINEERING SCIENCES			
00060	HMM/Hatch Acres Administration	✓		
00120	Project Management	✓		
00121	Project Coordination	✓		
00124	Community Liaison	✓		
00132	Drawing Production	✓		
00200	Progress / Activity Reports	✓	✓	
00240	Field Progress Reports	✓	✓	
00280	Progress Photographs	✓	✓	
00300	Schedules	✓		
00400	Estimates and Costs	✓		
00539	Department of Fisheries and Oceans (DFO)	✓		
00541	Ministry of the Environment (MOE)	✓		
00549	Ministry of Natural Resources (MNR), including Niagara Peninsula Conservation Authority (NPCA)	✓		
00559	Other Provincial - Niagara Parks Commission (NPC)	✓		
00576	Municipal – Counties and Regions – Regional Municipality of Niagara (RMON)	✓		
00577	Municipal – Cities – Niagara Falls, Niagara-on-the-Lake, Welland	✓		
00600	Procurement	✓		
01900	Quality Engineering	✓		
02700	Hydraulic Engineering	✓	✓	✓

SCI Listing for Project Document Management

SCI #	Description	Correspondence	Reports	Drawings
02720	Hydraulics (Welland River WL)	✓	✓	
02730	Hydrology and Climatology	✓		
07000	Environmental Studies	✓	✓	✓
07010	Site Investigations	✓		
07080	Hazardous Materials	✓	✓	✓
07300	Waste Management	✓	✓	✓
07500	Noise Theory, Control and Effects	✓	✓	✓
08104	International Joint Commission	✓		
08506	Relations with Power Suppliers			
10000	SITE and IMPROVEMENTS			
10120	Geotechnical Investigations	✓	✓	✓
10160	Ground Surveys	✓		
10190	River and Groundwater Investigations	✓	✓	
11000	Property Acquisition	✓		✓
13000	Site Access Systems (Permanent)	✓	✓	✓
20000	BUILDINGS and STRUCTURES			
20100	General Arrangement	✓	✓	✓
26500	Cofferdams	✓	✓	✓
29230	Tunnels (Including Liner)	✓	✓	✓
29270	Dewatering Structure	✓	✓	✓
29300	Intake Structures (Including Service Gates)	✓	✓	✓
29700	Outlet Structures (Including Gates and Hoists)	✓	✓	✓
60000	INSTRUMENTATION and CONTROL			
62900	Instrumentation – Water Conveying Structures	✓	✓	✓
80000	CONSTRUCTION INDIRECTS (Temporary Facilities and Services)			
81000	Site Administration	✓		
83000	Materials Management	✓	✓	✓
84500	Construction Roads and Bridges (On Site)	✓	✓	✓
85100	Health and Safety	✓	✓	✓
85200	Security	✓	✓	✓
86000	Camp Facilities and Services	✓	✓	✓
88200	Tunnel Excavation Equipment	✓	✓	✓
88400	Material Disposal	✓	✓	✓

All documents will be managed through the Project Records Centre in Niagara Falls, and the Project Records Centre becomes the owner of the document for all edits, submissions, etc.

19.3.1 Correspondence

Correspondence originated by all Project staff must be assigned a proper file number during its preparation. No more than one cross-reference file number is to be applied. The Official Record copy of all correspondence must be routed through the OR Project Manager to the Project Records Centre, in a timely manner.

The recipient of correspondence originated by external parties should identify the date received, apply a proper file number on the original, make any necessary working copies, and route the original through the OR Project Manager to the Project Records Centre, in a timely manner.

19.3.2 Drawings

The drawing originator will provide the appropriate SCI number to identify the drawing(s) and arrange assignment of a new drawing number(s) from the Project Records Centre in Niagara Falls; e.g., NAW130-D4E-29230-0001-00,

Property Number	NAW130
Document Type	D (Drawing)
Drawing Size	4 (or appropriate size)
Document Source	V (Contractor) or E (Owner's Representative)
SCI Number	XXXXX
Serial Number	XXXX
Revision Number	XX

All drawings to be produced by the Contractor and others must be assigned appropriate OPG drawing numbers. For this purpose, the Contractor will indicate the number of required drawings in each SCI category and arrange, through the OR, for a block of new drawing numbers from the Project Records Centre in Niagara Falls.

All drawings are to be provided in electronic format as well as hard copy, which will be stamped and signed.

Other drawings received from third parties and manufacturers will be assigned drawing numbers on receipt.

19.3.3 Other Documents

The document originator will provide the appropriate SCI number to identify the document(s) and arrange assignment of a new document number from the Project Records Centre. The required report number format is as follows; e.g., R-NAW130-29230—0001:

Document Type	R (Report), T (Tender), P(Proposal)
Property Number	NAW130
SCI Number	XXXXX
Serial Number	XXXX

All documents to be produced by the Contractor must be assigned appropriate OPG document numbers. For this purpose, the Contractor will indicate the number of required documents in each SCI category and arrange, through the OR, for a block of new document numbers to be assigned from the Project Records Centre.

Other documents received from third parties and manufacturers will be assigned document numbers on receipt.

19.4 Electronic Document Management System (iXOS)

OPG Hydroelectric has an electronic document management system called iXOS. Niagara Tunnel Project documents (e.g., drawing, manuals, reports, correspondence, etc) should be formulated in electronic format compatible with the iXOS. Hydroelectric software standards (AutoCad and Microsoft Office – Word, Excel, Powerpoint and MS Project) have been adopted for use by all members of the Project team to facilitate convenient information exchange. Primavera P3 will be utilized for development of the Project schedule.

20 Project Closeout

20.1 Purpose

The purpose of the Project Closeout Phase is to ensure that all Project related activities and deliverables are complete prior to completion of the Project and to determine whether the asset is attaining or exceeding the performance objectives (Guaranteed Flow Amount, etc).

20.2 Description

The Closeout phase involves doing all the activities identified in the Project Closeout Plan to complete an orderly windup of the Project. This includes handoff of all remaining deliverables to the end users, closing out all contracts, finalizing Project costs and closing the OPG work order, ensuring the necessary records are filed, and reviewing lessons learned from the Project.

The OPG Project Director is responsible for preparing a Project Closeout Report or causing such report to be prepared by the OR and the Project Sponsor is responsible for reviewing and accepting it, after verifying that the scope of work and the Project objectives have been completed satisfactorily.

After the Project is in-service, a Post Implementation Review (PIR) will be conducted to verify that the Project business objectives have been achieved and to capture lessons learned for future projects.

When it is determined that the scope of work and the Project objectives have been completed satisfactorily, the OPG Project Director will prepare a Certificate of Acceptance for acceptance by the Project Sponsor .

20.3 Prerequisites

Prerequisites for the Project Closeout Phase are

- Certificate of Substantial Performance of the Niagara Tunnel Facility Contract
- new tunnel in operation
- Project Closeout Plan
- operating license (if applicable).

20.4 Key Activities

Key activities in the Project Closeout Phase are

- scope verification
- flow verification test
- finalise as-built documentation
- turnover all Project documentation to Niagara Plant Group
- prepare Deficiencies report, including schedule for rectification
- prepare Project Completion Report
- prepare Project Management Controls Report
- prepare Certificate of Acceptance
- complete OPG Report of Equipment In Service (REIS).

20.5 Project Closeout Plan

The Project Controls Manager will prepare a Project Closeout Plan and schedule for the assistance and direction of the Project team during the Project Closeout Phase and, on acceptance of the plan by the OR Project Manager and the OPG Project Director, will monitor adherence to same.

The OR Project Manager will ensure compliance with the requirements of the Project Closeout Plan.

20.6 Schedule for Rectifying Deficiencies

The schedule for rectifying deficiencies will be prepared from the Project Deficiency List. Preparation of this list will be coordinated by the OR Project Manager with inputs from the

- Construction Manager for the Niagara Tunnel Facility Contract and Miscellaneous Construction Contracts
- Environmental/Third Party Manager for EA and third party issues
- OR Controls Manager for all other outstanding items.

The schedule format will be a check list or punch list with required milestone dates. The persons identified above as being responsible for preparing the deficiency lists will also be responsible for preparing and identifying the target schedules for correcting the deficiencies. These target schedule requirements will be discussed on a weekly basis with the Design/Build Contractor, together with the Contractor's proposed actions/timing for rectifying deficiencies.

These same managers will be responsible for recording and monitoring actual progress for review and action by the OR Project Manager.

20.7 Scope Verification

The purpose of scope verification is to ensure that all work is completed correctly and satisfactorily.

The OR Project Manager will prepare a report for the OPG Project Director's acceptance, cataloguing all aspects of compliance with the Project scope, including a signed off and completed deficiency list.

20.8 Finalised As-Built Documentation

Finalised as-built documentation will be collected and/or prepared by the Project team.

As-built documentation will include

- as-built drawings from the Contractors
- design calculations for any changes to the initial contract design
- a listing and scope description for all approved Contract changes
- a listing, description and impact report of any outstanding deficiencies which will not be rectified
- warranties for the construction contracts
- approvals and sign-offs from all third part agencies and regulators.

20.9 Turnover Documentation to Niagara Plant Group

The main purpose of the turnover of documentation is to formally transfer ownership of the completed tunnel facility and all associated documentation to the Niagara Plant Group.

The turnover of all documentation will take place when Final Completion of the Tunnel Contract has been certified and all final documentation is available. A staged handover may be appropriate in some areas.

The documents to be turned over will include

- a full set of original contract documents for all Contracts and Purchase Orders executed as part of the Project
- all amendments to same
- all original agreements with and certificates of approval from all third party agencies
- all amendments to same
- as-built drawings from the Contractors
- design calculations for any changes to the initial contract design
- signed-off deficiency lists
- a listing, description and impact report of any outstanding deficiencies which will not be rectified
- warranties for the Construction Contracts
- operating and maintenance manuals for the tunnel facility
- spare parts list
- training documentation for the facility
- all permits, certificates and licenses
- quality assurance records
- all Project correspondence files save those deemed “privileged” by OPG Law Division, such later files will be delivered to OPG Law Division.

20.10 Deficiencies Report

The OR Project Manager will prepare a deficiency report for any deficiencies remaining uncorrected after Final Contract Completion.

The report will indicate the nature of such deficiencies, their deviation from the approved design and/or scope, their impact (if any) on the operation, maintenance and life-cycle cost to operate the facility, and the changes made to the Contract Price to permit acceptance of such remaining deficiencies. This report will be submitted to the Project Director for acceptance/approval.

In the event that there are outstanding deficiencies remaining after the Tunnel has been declared in-service, a clean-up work order may be opened to hold funding necessary to complete the outstanding items.

20.11 Project Completion Report

The Project Completion Report will be prepared by the Project team under the direction of the OR Project Manager and will

- analyse Project performance relative to the Project Execution Plan
- identify problems in Project execution and their solutions
- record the Project history focusing on those things the Project team would do again or do differently on another similar project. This information would be of particular importance to OPG should the fourth tunnel ever be built, and would also prove useful as OPG pursues other generation projects.

The "Lessons Learned" part of the report will address, among other things, the following:

- What contributed most to the success/failure of the Project?
- What worked well? What did not work well?
- What constraints limited our performance? How could those constraints be removed in future?
- Where did we have problems? Should these have been foreseen? If so, what indicators were missed?
- What innovations did we introduce on this Project? What were their impacts?
- What other things could we have done to improve Project performance and success?
- Is the client (Niagara Plant Group) satisfied with the facility as delivered?

20.12 Project Management Controls Report

The Project Controls Manager will document all Project controls issues arising from the management of the Project including cost, scope and schedule variances.

20.13 Certificate of Acceptance

The purpose of the Certificate of Acceptance is to ensure that all Project stakeholders and the Project Sponsor are satisfied that the Project is complete and meets their requirements.

A formal document will be prepared by the OPG Project Director for the approval and signature of the OPG Project stakeholders. This document will be accepted by the signature of the Niagara Plant Group Manager and the Project Sponsor.

20.14 Asset in Service Report

Upon successful completion of commissioning, the tunnel will be ready for full commercial operation by the Niagara Plant Group. At this stage the OPG Project Director and the Niagara Plant Group Manager will complete and file the Report of Equipment In-Service form. The interest charged to the Project will then stop as the facility begins commercial service.

Appendix A – Project Charter

ONTARIO POWER GENERATION

File No. NAW130-00120 T5

PROJECT CHARTER

Project ID – EXEC0007	Revision 01	December 23, 2005

Project Name & Location

Niagara Tunnel Project (the **Project**), Niagara Falls, Ontario

Need & Justification

The Ontario Government, OPG's sole shareholder, has endorsed this Project as being consistent with its objective of promoting the development of cost competitive, environmentally friendly sources of electricity generation. The planned tunnel will facilitate greater utilization of available Niagara River water in the existing Sir Adam Beck (SAB) generating facilities, increasing the average annual energy output by about 1.6 TWh. At an estimated Levelized Unit Energy Cost (LUEC) of approximately 4.8 cents/kWh (2005$), this Project provides a competitive alternative for supplying future needs of the Province.

Objectives

To divert an additional 500 cubic metres per second of water from the upper Niagara River to the SAB complex at Queenston, in a safe, economic and timely manner. This will be done, to the extent practical and possible, in a manner that reflects and meets the requirements of the primary stakeholders. Specifically, the project objectives are to:

- Maintain a safe working environment.
- Execute the Project on schedule and within budget.
- Meet all environmental and mitigation requirements.
- Achieve high quality of design and construction, meeting performance requirements.
- Minimize impacts on the ongoing operation of the Sir Adam Beck complex.
- Maintain a good working relationship with stakeholders, contractors and the affected public.

The Province of Ontario and OPG consider delivery of this project to be a top priority.

Scope and Deliverables

The Project includes the planning, design, construction, commissioning and placing into service of a 10.4 km long diversion tunnel with a nominal 12.7 m internal diameter, including all associated facilities and enabling work.

The Project will be executed in two phases as follows:

Phase 1 (June 2004 to August 2005 – Completed)
This phase included project activation, project planning, conceptual design, permitting / approvals submissions, and procurement of a design / build tunnel contract. The planning and design of enabling work such as road improvements and power hookups was also part of this phase.

PROJECT CHARTER

Project ID – EXEC0007	Revision 01	December 23, 2005

Key Deliverables included engagement of the Owner's Representative (OR), contractor pre-qualification, contractor selection, executed design-build contract, applicable permits / approvals and third party agreements, designs for enabling work, a Release Quality Estimate (RQE) and a Business Case for Project approval by OPG's Board of Directors.

Phase 2 (September 2005 to September 2010)
This phase includes obtaining applicable permits / approvals, detail design, construction, testing and commissioning of the diversion tunnel, and construction and installation of enabling works. Key Deliverables include permits / approvals, detailed design and construction of the diversion tunnel and associated facilities, diversion tunnel commissioning, placing into service and performance testing, and a Project close out report.

The scope of the Project is more fully described in the Project Execution Plan (PEP).

Customer(s)

OPG's Niagara Plant Group

Key Stakeholders

Province of Ontario (OPG's sole shareholder)
Regional Municipality of Niagara
City of Niagara Falls
Town of Niagara-on-the-Lake
Ontario Ministry of the Environment
Ontario Ministry of Natural Resources
Ontario Ministry of Finance
Niagara Parks Commission
Niagara Peninsula Conservation Authority
Fisheries and Oceans Canada (DFO)
International Niagara Board of Control

Major Milestones

The current project schedule is as follows:

Start Phase 1	June 2004	Actual
OPG Board Approval	July 2005	Actual
Award Design / Build Contract	August 2005	Actual
Phase 1 Completion	August 2005	Actual
Start Construction	September 2005	Actual
In-Service Date	October 2009	
Phase 2 Completion (includes Contingency)	September 2010	

Budget

A budget of $985 million was approved by the OPG Board of Directors on July 28, 2005 conditional on approval of financing for the Project by the Government of Ontario which was obtained on August 17, 2005.

The approved budget includes funding for OPG's obligations under the Niagara Exchange Agreement (to secure water rights for the tunnel and facilitate reversion of the Ontario Power GS and Toronto Power GS buildings to the Niagara Parks Commission) valued at $32.4 million. This work is addressed under a separate Charter and a separate Project Execution Plan.

Constraints & Limitations

The Government of Ontario, through the Ministry of Energy, indicated a strong desire for the Niagara Tunnel to be completed in the shortest possible time. The selected design / build contracting approach provides the best means to achieve this objective.

The work must be performed in compliance with the Environmental Assessment (EA) approval conditions.

Project Execution and Management

The Project will be substantially undertaken by a design / build contractor, with oversight provided by OPG staff and Owner's Representative staff. Specialist contractors and consultants may also be engaged on an as needed basis.

The Project Director will ensure that a detailed Project Execution Plan (PEP) for acceptance by members of the project team and approval by the Project Sponsor. The PEP will include a description of the Project organization and associated roles and responsibilities. It will also include a reporting plan, describing the proposed flow of information and documentation to the Project Sponsor and ultimately to OPG's Board of Directors.

All significant proposed changes to project configuration (including scope, budget, timeline and quality) must be submitted to the project Change Control Board for evaluation before submission to OPG's senior management.

ONTARIO POWER GENERATION

File No. NAW130-00120 T5

Authority of Project Director
This document authorizes the Project Director to undertake the Project, reasonably utilizing OPG resources and third party resources as appropriate. More specifically, the Project Director is authorized to: o Approve project in-scope expenditures up to approved Project funds ($985M), in collaboration with OPG's management and in accordance with OPG's Organizational Authority Register. o Directly request assistance from OPG functional departments, as necessary. o Retain contractors and consultants, as required. o Commit OPG, in discussions / negotiations with regulatory agencies and other stakeholders with respect to satisfying conditions of the EA Approval.

Signatures		
Project Director (R. Everdell)		Date 08 Feb 2006
Niagara Plant Group Manager (D. Heath)		Date: 08 Feb 2006
Project Sponsor (E. Elsayed)		Date: Feb 9, 2006

Appendix B – PEP Ownership

PEP Section		Owner
1	Introduction and Background	H. Charalambu
2	Purpose of Project and Objectives	H. Charalambu
3	Project Scope	H. Charalambu
4	Project Authorization	E. Elsayed
5	Health and Safety Management	D. Gallina
6	External Stakeholders	C. Mee
7	Approvals and Third Party Requirements	C. Mee
8	Execution and Delivery Strategy	H. Charalambu
9	Organization, Roles and Responsibilities	H. Charalambu
10	Authority Levels	E. Elsayed
11	Schedule and Milestones	J. Tait
12	Project Cost Estimate	J. Tait
13	Project Controls and Reporting	J. Tait
14	Risk Assessment and Risk Management	H. Charalambu
15	Engineering Management Plan	M. Hughes
16	Construction, Installation and Commissioning Management Plan	R. Delmar
17	Environmental Plan	C. Mee
18	Communications Plans	C. Walker C. Mee
19	Records Management	M. Walsh
20	Project Closeout	J. Tait

Appendix C – Niagara Plant Group Memorandum of Understanding

Memorandum of Understanding

Between the

Niagara Plant Group (NPG)

and the

Niagara Tunnel Project (NTP)

February 2006

Background

The Niagara Tunnel Project (NTP) is a major undertaking with the objective of increasing the hydroelectric energy produced at the Niagara Plant Group (NPG) by approximately 14%. Construction will commence in 2005 and will require 4 to 5 years to complete. Separate organizations are in place, one to construct the tunnel (NTP) and one to operate and maintain the existing facilities (NPG). The NPG is the end user of the new tunnel. The NTP organization consists of both OPG staff and Owners Representative (Hatch Mott MacDonald & Hatch Acres) staff. As the tunnel project will not be undertaken on a greenfield site, the two organizations will be sharing some NPG facilities / space and dealing with many of the same third parties as they work towards meeting their respective and common objectives.

NTP has retained a Design/Build contractor (Contractor) to design and construct the new tunnel.

The purpose of this memorandum is to identify the areas where these shared interfaces exist and to agree on accountabilities / processes to assist each other.

Successful completion of the Niagara Tunnel Project will be directly related to the quality of communication between the NTP and the NPG. The quality of communication is improved when the involved parties make the required effort to develop a clear understanding of each other's objectives, responsibilities, constraints, policies and procedures.

This memorandum of understanding is intended to identify the areas where both NTP and NPG have accountabilities and describes how the parties communicate and assist each other. The memorandum also refers to separate specific protocols that may be required to coordinate activities. Reference should also be made to the current Project Execution Plan (PEP) for such details.

Constraints

A number of constraints will affect how the Project is executed and how the parties communicate with each other. These constraints are as follows:

- The Niagara Plant Group is unable to provide significant resources to assist the project. The general rule is, if NPG is requested and has spare capacity to provide needed resources to NTP, it will. NPG will not increase its resources. NPG will have a representative on the NTP who will act as the Single Point of Contact (SPOC) for NPG and be responsible for identifying and helping resolve interface issues.

- The tunnel project will be constructed in accordance with a design / build contract. Ontario Power Generation (OPG) involvement in design and construction activities will be minimal.

- NPG interactions with the Contractor will be through the Project Manager of OPG's Owner's Representative (OR) who will facilitate appropriate application of relevant OPG, EP and NPG policies and procedures. Administration of the Design/Build contract and direction of the Contractor will be exclusively through the OR Project Manager.

- Any OPG / NPG involvement in the project that impacts on the construction schedule that is not dealt with before the contract is awarded will add additional project costs and schedule delays. Cost increases are expected to be in excess of $400k per day for OPG caused delays.

- The NPG energy revenues are in the order of $2 million per day, so any disruptions to NPG operations must be kept to an absolute minimum.

- INCW and GIP operations are Joint Works shared with NYPA and operated within constraints established by international agreements. NTP work must be conducted within these constraints.

Project Execution

1. Business Case Development

NPG will provide operating, maintenance and flow forecasting information to the NTP to assist in the preparation of the business case and analysis of optional elements. Financial models developed for the NTP will be made available to NPG through OPG Corporate Finance.

2. Operating Constraints

No changes to the operating constraints on the existing facilities will be accepted without the agreement of NPG. NPG will define the data required to update the existing operating and reporting systems to incorporate the third tunnel. NTP will provide the required data as soon as practical.

3. Existing Facilities

Existing site infrastructure will not be modified without the agreement of NPG.
During the execution of the project opportunities may present themselves for the NPG to partner with the project for mutual benefit (i.e. INCW dewatering equipment, services infrastructure post project). All such initiatives must be approved by the OR project manager accountable for contract implications.

4. Design Review

NPG will participate in NTP design reviews as scheduled with particular interest in the operating and maintenance features of the project. In general NPG will participate in reviews pertinent only to permanent facilities and those temporary facilities that may impact NPG operations. NPG will ensure that representatives reviewing design information have the authority to comment on behalf of OPG. The NTP will make every reasonable effort to provide sufficient advance notice of design review activities and to allow an adequate time for review of design information by NPG, consistent with maintaining the project schedule. NPG agrees to complete required reviews in a timely manner responsive to NTP requirements.

All design reviews undertaken by NPG/OPG will be coordinated through the SPOC

5. Construction

A construction island will be established on NPG property in the tunnel outlet area and placed under the control of the Contractor, as Constructor under OHSA, for the duration of the construction. The construction island will be delineated by a combination of existing and new fences and will be accessed by a new entrance from Stanley Avenue that is separated completely from existing site access as illustrated on OPG drawings NAW130-D0E-80000-0012 and NAW130-D0E-80000-0013. NPG will turn over control of existing fences and the Contractor will install new fences, as necessary to delineate the perimeter boundary and to separate any sensitive areas. The Contractor will be responsible for maintenance of these barriers throughout the construction period.

The INCW Part Project construction area will be established in the vicinity of the tunnel intake and will be delineated by physical barriers and other markers as illustrated by OPG drawings NAW130-D0E-80000-0014 and NAW130-D0E-80000-0015. The INCW Part Project area will occupy NPG lands and lands leased from the Niagara Parks Commission specifically for execution of the NTP. Except for specific periods when OPG, through the OR, will be the Constructor under OHSA, because of the nature of the work (marine work upstream from the INCW control gates, sharing access to the INCW, etc), this area will be part of the construction island placed under the control of the Contractor, as Constructor under OHSA. The existing control structure and control building will remain under the control of OPG / NPG throughout the duration of the construction work.

The OR will hold Work Protection as required for execution of the INCW Part Project. To meet the needs of the Project, sufficient OR staff members will receive the mandatory training in January 2006 from the EP Training and Development Centre. Field assignments required tocomplete the training for each OR 'Holder of Record' will be facilitated by NPG staff in February / March 2006.

6. Public Safety

A protocol will be developed to define how public safety activities of the NTP Contractor and NPG will be coordinated.

The Contractor will be responsible for public safety within the construction island, including undertaking investigations of incidents.

7. Security

The Construction Site Security Guideline checklist tool as developed by the Construction Industry Institute (CII) will be utilized to coordinate site security issues between the NTP Contractor and NPG.

The Contractor will be responsible for security within the construction island.Reporting of security incidents will be through the OR both for NTP and NPG?.

NPG and NTP will jointly prepare a protocol for reporting security incidents and for communication of security threats.

8. Emergency Response

NPG and the Contractor (through the OR) will establish coordinated emergency response procedures as soon as practical following award of the contract. Access to the SAB1 Canal rescue lifeline will remain under the control of NPG.

The Contractor will be responsible for initiating emergency response within the construction island and for informing the NPG Control Room.

Protocols will be jointly developed by NPG and NTP regarding; emergency response and evacuation, medical emergencies and dam safety related emergency response.

OR staff that are potentially incident coordinators during the Part Project work will participate in a dry run of the NPG emergency response procedures.

9. Site Access/Tours

Access measures are in place to control NPG staff access to the Project and Project staff access to NPG facilities. A protocol will be developed to expedite access for NPG staff

performing maintenance on critical equipment such as the cross over gauge. It is understood that NTP activities may cause some temporary disruptions or inconvenience to NPG operations. The NTP will make every effort to provide advance notice of activities that may impact on the plant group and to work with NPG staff, through its SPOC, to minimize the impact.

It is acknowledged that NPG or its contractors will require occasional access to the construction island (eg. for spider spraying). Arrangements must be made through the OR.

All project related site tours must be arranged by and through the OR and all tours of the plant must be arranged by and through the SPOC. If tours involve dignitaries, media, government relations and formal agencies both the NPG and NTP will ensure the other party is informed in a timely manner.
A protocol will be developed to document the management of tours and special events that involve both NPG and the NTP.

10. Community Relations

The Niagara Plant Group is accountable for OPG community relations in the Niagara Region. The Public Affairs Officer from the NPG will be one of the OPG representatives on the Liaison Committee as defined in the Community Impact Agreement.

NPG will be responsible for all direct communications with the public, in particular, receiving and responding to any complaints.

NPG will continue to coordinate communications with external agencies within Niagara region including all municipalities, the Niagara Parks Commission (NPC), the International Niagara Board of Control and the New York Power Authority (NYPA). Initial and senior level contacts will generally be through NPG.

11. Regulatory Relations

Both the NTP and the NPG will require permits and approvals from common regulatory bodies. The Project will keep the NPG informed of activities involving the regulatory agencies. Particular attention will be given to monitoring / reporting / operating / maintenance activities or other commitments that may extend beyond the completion of the project. NPG signoff will be required in advance of finalization of approvals where commitments could extend beyond the duration of the project.

OR will invite NPG to any agency meetings where long-term commitments will be discussed. Similarly, NPG will be provided with all permit submissions related to any long-term commitments.

12. Communications

NTP external communications will be approved by the NTP Project Director following consultation with NPG.

Project-specific, working-level contacts will be established between the NTP and affected ~~agencies~~ agencies.

13. Labour Relations

The NTP team will determine what, if any, role NPG is to play in labour relations for the NTP. It is anticipated that the NPG will provide only limited EPSCA process support.

14. NPG Procedures

To avoid double standards for NTP / NPG staff, where appropriate and possible, existing policies and procedures of NPG will apply for the NTP. NTP requests for NPG assistance will generally be limited to normal business hours of the NPG.

15. Excavated Materials Management

Excavated materials management could continue long after the completion of the project. The NPG will participate on the Excavated Material Re-Use Committee and review/endorse any long term commitments related to material management prior to their finalization in order to advance the project.

16. Outage Planning

The NTP will participate in the outage planning process established by NPG. This will ensure outages are identified in advance and allow total outages required by the NTP and NPG to be minimized. NTP outage requirements are expected to be limited to PGS outages for removal of the canal rock plug and PGS Dewatering Structure.

NTP will notify the NPG 18 months prior to a scheduled outage for any Plant Group facilities. NTP will provide timely updates to any changes to this schedule. NTP will be invited to NPG outage planning meetings during the 18 month lead time prior to an outage.

17. Transfer to Operations

The NTP will engage NPG staff in training, commissioning and turn-over activities to facilitate a smooth transfer when the tunnel is ready for commercial service. These activities will be coordinated through the NPG SPOC.
NTP will follow the intent of the current NPG equipment turnover approved instruction.

A detailed commissioning plan will be presented to NPG for acceptance in a timely manner well prior to the planned in-service date.

18. NPG Resource Requirements to assist NTP

NTP will develop an anticipated scope of work for the NPG for project related work including schedules and budgets. The work program will be reviewed by NPG & NTP on a regular basis.

Signatures

Rick Everdell Project Director OPG Niagara Tunnel Project	Dave Heath Plant Group Manager Niagara Plant Group	Harry Charalambu Project Manager Owner's Representative (HMM) Niagara Tunnel Project
Date 1 March 2006	Date March 1, 2006	Date March 1/06

Appendix D – Acronyms and Definitions

BAR	Builders All Risk Insurance
BTX/BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CofA	Certificate of Approval
CBS	Cost Breakdown Structure
CCB	Change Control Board
CI	Change Initiation
CIA	Community Impact Agreement
CPI	Cost Performance Index
DFO	Fisheries and Oceans Canada (Department of Fisheries and Oceans)
DRB	Disputes Review Board
EA	Environmental Assessment
EOI	Expression of Interest
Facility Project	Niagara Tunnel Facility Project
GBR	Geotechnical Baseline Report
GFA	Guaranteed Flow Amount
GIP	Grass Island Pool
IESO	Independent Electricity System Operator
IJC	International Joint Commission
INBC	International Niagara Board of Control
INCW	International Niagara Control Works
iXOS	Electronic Document Management System
JSA	Job Safety Analysis
LUEC	Levelized Unit Energy Cost
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MOU	Memorandum of Understanding between Project and NPG
NPC	Niagara Parks Commission
NPCA	Niagara Peninsula Conservation Authority
NPG	Niagara Plant Group
NRHD	Niagara River Hydroelectric Development
OCIP	Owners Controlled Insurance Policy
OH&SA	Occupational Health and Safety Act
OPG	Ontario Power Generation
OR	Owner's Representative retained by OPG
ORST	Ontario Retail Sales Tax
Part Project	Part of Project where OPG is the Constructor (as defined in OH&SA) for a limited period
PCD	Project Change Directive
PEP	Project Execution Plan

PIR	Post Implementation Review
PGS	Pump Generating Station
Project	Niagara Tunnel Project
RMON	Regional Municipality of Niagara
RQE	Release Quality Estimate
SAB	Sir Adam Beck
SCI	System Classification Index
SPOC	Single Point of Contact
TBM	Tunnel Boring Machine
WBS	Work Breakdown Structure
WSIB	Worker's Safety Insurance Board
WUL	Wrap-Up Liability Insurance