

**UNDERTAKING JX2.4**  
**(NON-CONFIDENTIAL)**

**Undertaking**

To produce the Project Execution Plan for the Niagara Tunnel Project.

**Response**

See Attachment 1.

# **The Niagara Tunnel Project**

## **Project Execution Plan**

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Filed: 2010-11-10

EB-2010-0008

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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
R00	April 8, 2005	Incorporation of additional team comments. Issued for approval	HC
R01	March 27, 2006	Incorporation of Phase 2 activities	HC
R02 Draft 1	December 2009	Input from team in and after workshop December 2009; updated to incorporate changes affected by the ADBA	HC
R02	September 2010	Input from team; updated to incorporate changes affected by the ADBA	HC/RE

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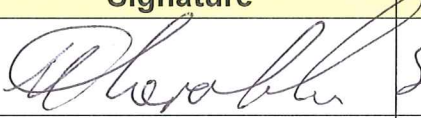

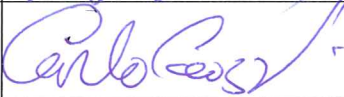
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# The Niagara Tunnel Project

## Project Execution Plan

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		Sept 24/2010
OPG Project Director		22 Sep 2010
OPG Project Sponsor		Sept 22/10

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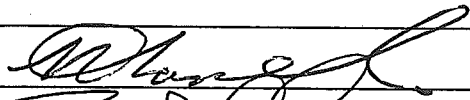
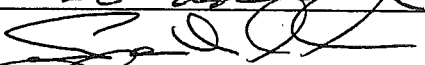
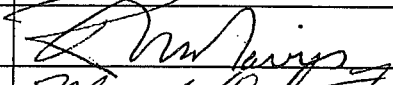
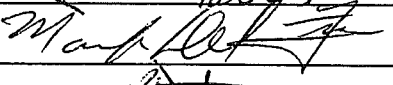
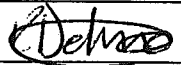

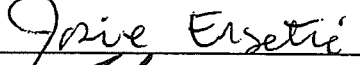
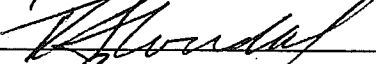
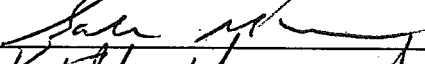


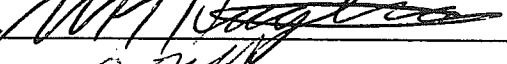
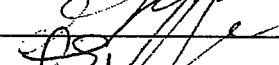
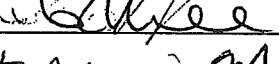
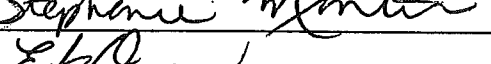

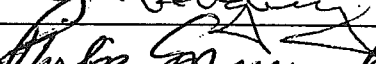


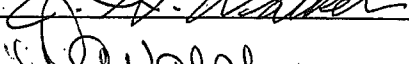
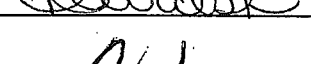
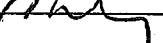
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# The Niagara Tunnel Project

## Project Execution Plan

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

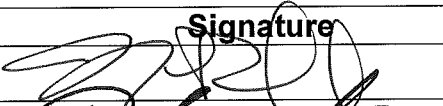
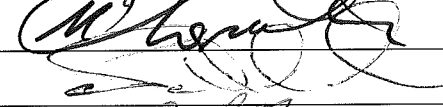
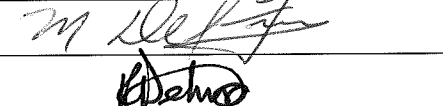
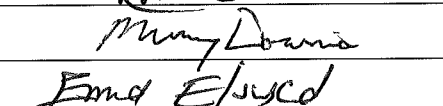
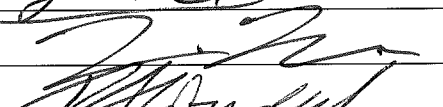
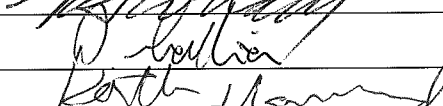
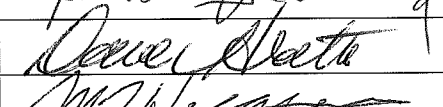
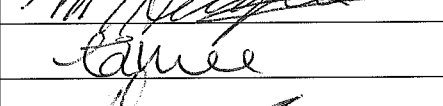
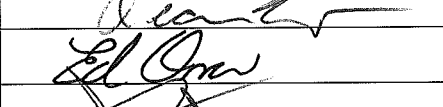
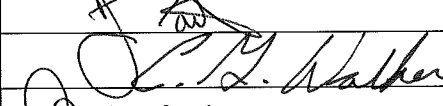
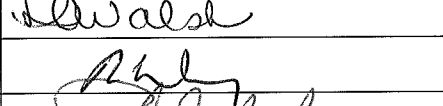
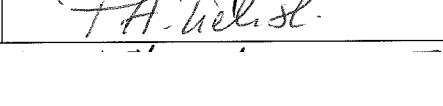



Name	Signature	Date
Brignal, Norm		
Charalambu, Harry		April 12/05
Da Silva, Neville		April 13/05
Davis, Mike		April 13/05
Del Frari, Mark		April 13/05
Delmar, Russel		April 12/05
Eden, David		
Elsayed, Emad		April 12, 2005
Erzetic, Josie		Apr. 13.05
Everdell, Rick		April 12, 2005
Gherbaz, Sabrina		April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

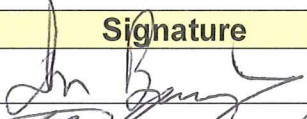
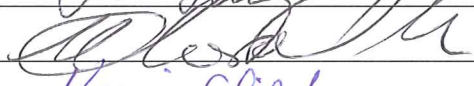
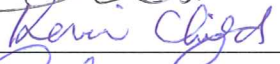
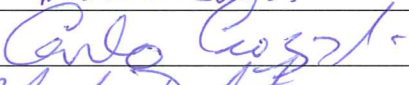

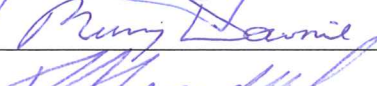
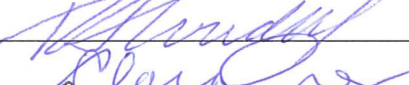


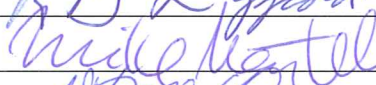
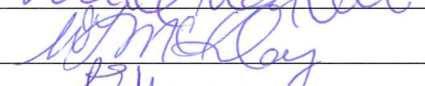
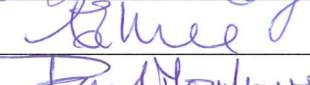
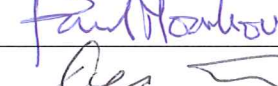
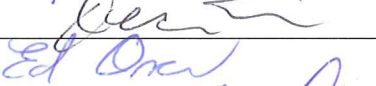
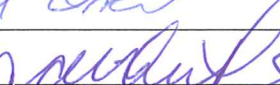






### Phase 2 - Project Team acknowledgement of participation in preparation of the Project Execution Plan

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
English, Tim		March 28/06
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

# The Niagara Tunnel Project

## Project Execution Plan

### Phase 2 (R02) - Project Team acknowledgement of participation in preparation of the Project Execution Plan

Name	Signature	Date
Brazier, Don		Sept 16/10
Charalambu, Harry		Sept 21/10
Child, Kevin		Sept 15/10
Crozzoli, Carlo		Sept 16/10
Del Frari, Mark		Sept 16/10
Downie, Murray		Sept 23/10
Everdell, Rick		15 SEP 2010
Greco, Clara		20 SEP 2010
Larivee, Greg		Sept. 16/10.
Lippold, Rod		SEPT 16 2010
Martelli, Mike		21 SEPT 10
McKinlay, Bill		Sept 20/2010
Mee, Cate		Sept 15/2010.
Moorhouse, Paul		SEPTEMBER 15, 2010
Norton, Dean		Sept 16, 2010
Over, Ed		Sept 20, 2010
Prange, Matthew		Sept. 17, 2010
Schwass, Richard		Sept 16/2010
Tait, John		Sep 15 2010
Tatone, Vic		SEPT. 23, 2010
Walsh, Mary Anna		15-Sept 10.

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Attachment 1 (NON-CONFIDENTIAL)

## 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 decided in 2004 to proceed with construction of one of the (EA approved) diversion tunnels. 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 included 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 flow reversal and water level 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 OPG Project Sponsor, the OPG Project Director and the Manager of the OPG's Niagara Plant Group (**NPG**) as the project customer.

A Memorandum of Understanding (the **MOU**) has been signed by the NPG and by the Project Team. This MOU, and associated protocols, elaborates on the relationship between the NPG and the Project Team, and clarifies the role of the NPG 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 and auxiliary works.

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 Design Build Agreement (**DBA**) for design and construction for the Facility Project to Strabag AG of Austria (**Contractor**). Phase 2 started on September 1, 2005, and included a contractual Substantial Completion Date of October 9, 2009.

The progress of tunnel excavation by the Contractor has been much slower than expected due to significant difficulties excavating and supporting the Queenston shale formation. This has resulted in significant overbreak in the tunnel crown, in some reaches of the tunnel. A dispute



review hearing process was consequently initiated to review the actual subsurface conditions compared to those that were anticipated as part of the DBA. OPG and the Contractor used the Dispute Review Board recommendations as a basis for renegotiating the original DBA into a Target Cost contract. In May 2009, OPG's Board of Directors approved the revised total Project cost estimate of \$1.6 billion and the revised schedule completion date of December 2013. The Amended Design Build Agreement (**ADBA**), with an effective date of December 1, 2008, was executed in June 2009.

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 OPG's Owner's Representative (**OR**) to facilitate development of the initial version of the PEP 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. Approval of the PEP by the Project Director and Project Sponsor is required before distribution. Revisions of the PEP, when necessary, will be the responsibility of the Project Director in consultation with the project participants.

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 (SAB) generating complex, increasing the average annual energy production by about 1.6 TWh. The Project provides a competitive alternative for meeting the needs of the Province with clean, renewable hydroelectric energy.

### 2.2 Objectives

The overall objective of the Project is the successful design, construction, commissioning and placing into service of a tunnel to divert at least an additional 500 m<sup>3</sup>/s of flow from the upper Niagara River to the SAB generating complex, executed in a safe, environmentally responsible, timely and economic 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 Health and Safety

OPG considers health and 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 is responsible for safety within its controlled areas. For the Part Project Area (as described below) during the execution of some of the work carried out at the International Niagara Control Works (INCW), 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 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/NPG.

#### 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-yr 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 ADBA requires the Contractor to demonstrate that the Guaranteed Flow Amount (GFA) of 500 m<sup>3</sup>/s through the diversion tunnel has been achieved by conducting specified flow tests. Should the GFA not be met, the Contractor will pay OPG a disincentive or if it is exceeded, an incentive amount will be paid by OPG to the Contractor.

#### 2.2.4 Schedule and Cost

The project is to be maintained within the approved schedule and 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 procedures have been established.

A target in-service date has been established in the ADBA. The target is subject to change under certain circumstances as outlined in the ADBA.

### 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 NPG. 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 NPG outage plans
- maintenance of positive relationships with regulators and host communities
- maintenance of ISO 14001 registration by the NPG
- maintenance of BSA 18000 registration by the NPG
- minimize ongoing (post\_Project) monitoring requirements by the NPG.

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 Project includes the planning, design, construction, commissioning and placing into service an approximately 10.2-km long diversion tunnel with an average 12.7-m (nominal) internal diameter, including all associated facilities and enabling work. The tunnel will divert 500 m<sup>3</sup>/s of the Niagara River flow from an intake located under the INCW structure, about 2 km upstream from Niagara Falls, to an outlet that will discharge into the existing canal system that feeds the existing SAB generating stations. 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 DBA with Strabag AG. The planning and design of enabling work such as road improvements, groundwater monitoring, property acquisitions and utility connections was also part of this phase.

Key deliverables included Contractor prequalification, contractor selection, executed DBA, 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 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. This phase also includes a separate Charter and PEP for Ontario Power/Toronto Power Reversion Project and compensation under the Community Impact Agreement and Welland River agreement.

Key deliverables include permits/approvals, detailed design and construction of the diversion tunnel and associated facilities, tunnel commissioning and placing into service, performance testing, site restoration and project closeout including a closeout report and transfer of permanent records to OPG/NPG.

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 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 current ADBA but are required to be implemented prior to, or during the course of, the 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 (**CIA**) between OPG and host 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 DBA 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.

Renegotiation of the contract changed some of the items that were part of the original procurement process listed above

- GBR has been replaced with a Geotechnical Report (**GR**)
- The fixed price contracting strategy with liquidated damages and bonuses has been amended to a target cost contract with a target completion date and includes incentives and disincentives.

#### **3.2.1 Tunnel Construction**

The Contractor experienced significant difficulties in safely excavating and supporting the section of tunnel in the Queenston formation. This has resulted in rerouting part of the tunnel to minimize the length of tunnel passing through the Queenston formation. To facilitate the vertical realignment out of the Queenston formation, the horizontal alignment was shifted about 200 m

eastward, directly below Stanley Avenue and out from the shadow of the existing SAB2 tunnels. This shortened the tunnel length by about 200 m to 10.2 km.

Additional subsurface rights have been obtained to accommodate the realigned tunnel. A TBM is being utilised to construct the tunnel. Tunnel construction commenced from the outlet area.

### 3.2.2 Intake Area

The Intake Area includes development of a suitable site 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 is along a new separate access road 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 be required 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 is the "Constructor" under the Occupational Health and Safety Act (**OHS**A) when work is performed under the 'INCW Part Project' designation. This approach has received approval from the Ministry of Labour (**MOL**).

### 3.2.3 Outlet Area

The main construction facilities are on OPG's lands, located between the Pump Generating Station (PGS) Reservoir and the existing SAB2 canal. Access is provided by a new road connection to Stanley Avenue. Temporary signalization is required at the intersection with Stanley Avenue and was installed by the Regional Municipality of Niagara (**RM**ON) on behalf of OPG. Material excavated for tunnel construction is stored/disposed on OPG lands between the SAB1 and SAB2 canals. Any materials suitable for reuse are to be segregated and made available for such use. The disposal site is to be graded and restored prior to the Contractor leaving the Project.

### 3.2.4 Intake Structure

The intake structure is a reinforced concrete structure 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 and ice management 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 pre-construction conditions.

The majority of the intake excavation will be done within a cofferdam and 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, must be constructed and the existing accelerating wall is to be demolished. Following removal of the TBM and completion of the concrete works,

the cofferdam will be removed. The works yard/laydown site will be restored to meet Niagara Parks Commission (NPC) requirements.

Extensive grouting of the upper rock formations at the intake end of the tunnel has been undertaken to minimize water inflows into the tunnel during the TBM drive through these formations. In addition, underwater excavation of an intake channel has been carried out upstream from the intake structure and beyond the confines of the cofferdam.

### 3.2.5 Diversion Tunnel

The tunnel is being excavated from the downstream end through limestones, sandstones and shales using a 14.44 m excavated diameter TBM supplied by the Contractor. The tunnel was initially constructed using an initial support of full-ring steel ribs, mesh, rock bolts and shotcrete. Subsequently, the Contractor changed its means and methods so that as the tunnel is being bored, workers behind the TBM cutterhead install various combinations of steel ribs, wire mesh, and rock bolts to reinforce the rock in the upper (approximately) third of the tunnel only. The surrounding surface is then sprayed with a layer of shotcrete to cover the exposed rock and form a protective shell. The tunnel is subsequently lined with a polyolefin waterproofing membrane in order to prevent fresh water in the tunnel from entering the host rock thus eliminating the well documented swelling potential in these formations. The final lining consists of cast-in-place unreinforced concrete at least 600 mm thick. The final lining will be prestressed using high pressure grout injected between the impermeable membrane and the initial lining.

Excessive overbreak in the tunnel crown, particularly in the Queenston shale formation, has necessitated the addition of an infill operation to restore the tunnel profile to a circular shape prior to installing the membrane and arch concrete. Elevated mobile, structural steel work platforms will accommodate drill jumbos, grouting facilities, shotcrete robots and material handling equipment needed for the arch profile restoration.

The tunnel crosses various geological formations. Tunnel lining design must 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 prevent diffusion of chloride ions out of the pore water of the shales. This will eliminate the advection and diffusion process necessary to mobilize 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 by OPG and the Contractor. The results of the tests will be used to determine the final GFA on which disincentives or incentives will be based.

### 3.2.6 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 forebays of the SAB generating stations.

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.

### **3.3 Enabling Activities and Miscellaneous Construction**

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

#### **3.3.1 Establishing Expropriation Rights**

Expropriation rights were made available to OPG through Bill 100, Electricity Restructuring Act, Section 51. OPG filed plans of expropriation for the entire tunnel length which

- corrected outstanding deficiencies or questions as to the scope and quality of OPG's subsurface property rights for the existing tunnels
- secured additional subsurface lands required for the third tunnel, including rights required for the horizontal realignment under the ADBA.

#### **3.3.2 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.

#### **3.3.3 Third Party Real Estate**

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

#### **3.3.4 City and RMON Right-of-Way Acquisitions**

With respect to municipally owned property, OPG Real Estate has expropriated subsurface property rights from the City of Niagara Falls and the Regional Municipality of Niagara (RMON). With tunnel realignment, the majority of these properties are under Stanley Avenue.

#### **3.3.5 NPC Real Estate Acquisitions**

With respect to property owned by the Niagara Parks Commission (NPC), OPG Real Estate has acquired via expropriation and negotiated agreement the necessary surface and subsurface property rights from the NPC. After completion of the Project, the surface property will be restored and returned to the NPC.

#### **3.3.6 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 has acquired by negotiated agreement the necessary subsurface rights. OPG does not have the right to expropriate these properties.

#### **3.3.7 Road Improvements**

The section of Stanley Avenue, between Whirlpool Road and Niagara Townline Road has been widened to improve access to the main construction site at the outlet. Road improvements included utility relocates and sewage and water connections for the Outlet area. A new turning



lane has been provided at the south end of Portage Road for the new intake access road. A new turning lane has also been 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 were carried out by the RMON on behalf of OPG under the terms of the CIA.

### 3.3.8 Pre-Construction Condition Surveys

A number of structures in the vicinity of the site were 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. Pre-construction survey work was undertaken by OPG/OR and involved a third party consultant. OPG/NPG and the Contractor were required to endorse the pre-construction survey before commencement of construction activities that could result in damages to the existing SAB PGS or INCW facilities. RMON conducted a pre-construction pavement survey of all roads to be used by heavy construction traffic and will undertake a post-construction survey to determine Project impacts.

### 3.3.9 Other Contracts

In addition to the main contract for the design and construction of the diversion tunnel, a number of smaller contracts are necessary for the implementation of the Project. These include contracts for

- examination of flow conditions in the Welland River
- installation of survey control monuments and third-party audits of the tunnel survey work carried out by the tunnel Contractor
- compilation of video footage of the Project progress
- a third-party consultant to assist the MOE with Project related issues
- a third-party facilitator to support the Project team building and alignment activities
- implementation of fish habitat compensation scheme at Drapers Creek
- decommissioning of wells and boreholes that were installed prior to Phase 1 and could interfere with tunnel construction
- relocation of fibre optic cable at the Intake area which would have been affected by the construction work
- installation and monitoring of groundwater control boreholes (monitoring transferred to Contractor during the construction period)
- pre- and post-blasting inspections of existing structures
- a third party accountant to assist with accounting system setup and review of Contractor expenditures/billings/reconciliations
- technical experts if/when required
- safety incident investigation services.

## 3.4 Project Management

Management of the Project is a combined responsibility of OPG and the OR as defined later in the PEP. These two parties work together as a team to enable the successful completion of the Project. Management activities are 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 Table 9.1 and detailed in Appendix E. In either case, all parties will be informed of

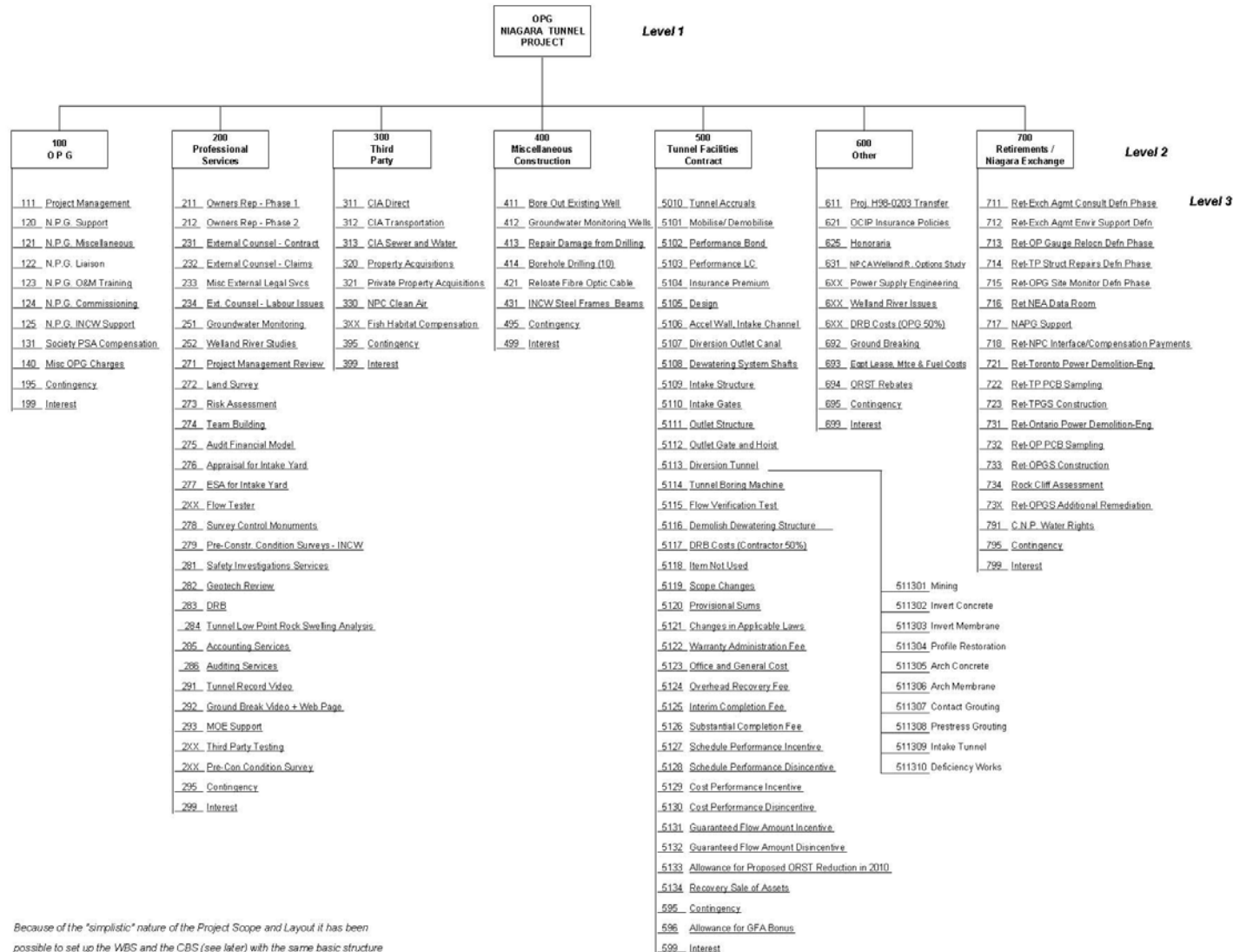
the activities of the other, as appropriate. The Project activities are being implemented through a single Project Director.

### **3.5 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
- permanent closure of boreholes installed as part of OPG's geotechnical investigation program except where such boreholes are intercepted by the tunnel, and then as additional scope to the ADBA.

## Exhibit 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 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 Ontario Electricity Finance Corporation (OEFC) on this basis.

In June 2004, the OPG Board approved a budget of \$10 million to initiate the implementation process for the Project (Phase 1) and was subsequently increased to \$22 million to include compensation required under the Niagara Exchange Agreement. OPG 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.

The superseding project cost estimate of \$1.6 billion and the revised scheduled completion date of December 2013 were approved by the OPG Board of Directors in May 2009. OPG and Strabag Inc signed the Amended Design/Build Agreement (ADBA) in June 2009.

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EB-2010-0008

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Attachment 1 (NON-CONFIDENTIAL)

## 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.

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 OHSA. For the INCW Part Project, OPG is designated as the “Constructor” and will fulfill its responsibilities under OHSA 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 (Workplace Safety & Insurance Board [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 Site Specific Safety, 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 is responsible for safety within its "construction island".

OPG has designated a "construction island" within which the Contractor is responsible for health and safety, security and public safety. The Contractor is the "Constructor" as defined under OHSA. 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 was required to submit final Safety Plans after signing the DBA and these were 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 Site Specific 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 Project's Policies and Procedures Manual. This plan keeps in mind OPG's 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 regular 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**

Refer to OPG's Safety Incident Management Standard (OPG-SFTY-STD-005), as updated from time to time, and the ADBA for the requirements and process for reporting all Project safety incidents.

#### **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) interaction between the Contractor and OPG employees.

#### 5.2.1.6 Training

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

#### 5.2.1.7 Contractor Compliance

The OR will primarily use documented field observations as an indicator of the Contractor's compliance to its project safety plan and applicable legislation. On a regular basis, typically weekly, OR Safety representative accompanied by the Contractor Safety representative will tour the work area. Compliance will be monitored against the Contractor's safety plan and applicable legislation.

The OR will issue an Owner-Only Project Safety Compliance Observation and Contractor Response ("Observations") via document transmittal to the Contractor noting areas of non-compliance. All observations will be referenced to a specific section from either the Contractor's safety plan or applicable legislation.

All Observations will be tracked and followed to completion.

### 5.2.2 INCW Part Project

For Part Project Area (as described below) activities carried out at the INCW, OPG will assume the role of "Constructor" at which times the Contractor will meet 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 as will construction activities utilizing the access to and along the INCW structure.

OPG applied to the MOL and received approval pursuant to Section 4 of the Construction Regulations under the OHSA for the designation of a discrete portion of the 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 OHSA, with the OR fulfilling OPG's obligations in this regard for on-site supervision, work protection, etc.



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 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 OHSA 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/OR 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. OPG’s Safety Incident Management Standard (OPG-SFTY-STD-005), as updated from time to time, and the ADBA outline the requirements and process for reporting and investigating INCW Part Project safety incidents.

#### 5.2.2.4 Staffing

During the Part Project the OR will provide a full time Safety Monitor (Part Project), working under the guidance of the Project Safety Advisor. The OR will also provide appropriately trained staff to fulfill the role of Constructor Supervisor and to apply for and hold OPG Work Protection when required for performance of the Part Project work.

#### 5.2.2.5 Interface Management

OPG, through the OR, shall ensure, that,

- The measures and procedures prescribed by the OHSA and applicable regulations are carried out on the project;
- Every employer and every worker performing work on the project complies with OHSA and the regulations; and
- The health and safety of workers on the project and the general public 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 Site Specific Safety Plan, First Aid/CPR and Policies 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 is 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 information through OPG's participation in the International Niagara Working Committee
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 Permits to Take Water Compliance Enforcement
Ontario Ministry of Natural Resources	Conditions of EA Approval Lakes and Rivers Improvement Act Work Permits and review of intake works design
Ontario Ministry of Energy	Energy production/rate impact
Ontario Ministry of Finance	Financing for the Project Ontario Retail Sales Tax (ORST)/ Harmonized Sales Tax (HST)
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 Administration of OHSA, periodic site visits, etc Compliance Enforcement

**Table 6.1 External Stakeholders**

Stakeholder	Statement of Interest
Niagara Parks Commission	Lease/use of NPC land for Intake Works Yard/access road Disruption to Niagara Parkway Groundwater monitoring locations Rankine Generating Station Subsurface property rights Impacts on adjacent NPC operations (Butterfly Conservatory, School of Horticulture, etc) Security Coordination
Niagara Escarpment Commission	Encouragement of reuse of Queenston shale Administration of lands under Niagara Escarpment Planning Act
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 (water and sewers, transportation plan, Liaison Committee) Community Impact Agreement Reuse of excavated materials Security Coordination
City of Niagara Falls	Conditions of EA Approval (water and sewers, transportation plan) Building Permits Community Impact Agreement
Town of Niagara-on-the-Lake	Conditions of EA Approval Community Impact Agreement Pump and water line for irrigation system
Niagara Falls Tourism	Community Impact Agreement through the City of Niagara Falls
Affected property owners	Subsurface rights
Marineland	Subsurface rights Access around water monitoring well Traffic congestion
Building Trade Unions	Work Jurisdiction EPSCA Agreements
Hydro One	Outage coordination Impacts on Hydro One transmission lines
Niagara Peninsula Energy Inc. (formerly 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 the principal stakeholders and their interests in the Project.

Early and sustained engagement of internal stakeholders is 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 Principal Internal Stakeholders**

Stakeholder	Statement of Interest
Niagara Plant Group/ Hydro Business Unit	<ul style="list-style-type: none"> <li>- Landlord</li> <li>- Client/Customer</li> <li>- Operate existing facilities</li> <li>- Facilitator for local contacts</li> <li>- Liaison with Niagara Region, City of Niagara Falls and Town of Niagara-on-the-Lake</li> <li>- Liaison with Niagara Parks Commission</li> <li>- Operating Restrictions and Outage Coordination</li> <li>- Design Review (outlet gate, hoist and controls and Intake service gates including handling and storage)</li> <li>- Administration of Work Protection Code</li> <li>- Contract Administration and Monitoring (for groundwater monitoring well installation)</li> <li>- Records retrieval and permanent retention</li> <li>- Coordination on Site Security, Public Safety and Emergency Response</li> <li>- Commissioning of new facilities/systems (Outlet Gate)</li> <li>- Transfer of Control of affected property and facilities</li> <li>- Review security, public safety and emergency response plans</li> <li>- Review commitments for ongoing post-project requirements, site restoration</li> <li>- Waste disposal</li> <li>- Reuse Committee</li> <li>- Ongoing commitments on NPG (e.g., Certificates of Approval)</li> <li>- Access to existing facilities, when needed</li> <li>- Coordinate clearance of interfaces (watermain, power/control cables at INCW, etc)</li> <li>- MOU and associated protocols defining interactions/commitments between NPG and the Project</li> </ul>

**Table 6.2 Principal Internal Stakeholders**

Stakeholder	Statement of Interest
Hydro Engineering	<ul style="list-style-type: none"> <li>- Geotechnical review of design and remedial works</li> <li>- Design review of gates, power supply and control systems</li> </ul>
Energy Markets	<ul style="list-style-type: none"> <li>- Operating Restrictions and Outage Coordination</li> <li>- Marketing Incremental Energy and ancillary products</li> </ul>
Society of Energy Professionals	<ul style="list-style-type: none"> <li>- Purchased Services Agreement regarding external engineering and professional resources</li> </ul>
Power Workers Union	<ul style="list-style-type: none"> <li>- Purchased Services Agreement consultation regarding external trades, drafting and clerical resources</li> <li>- Trades Work assignment under Chestnut Park Accord Addendum (CPAA)</li> </ul>
Board of Directors/ Risk Oversight Committee (Major Projects Committee prior to 2010Q2)	<ul style="list-style-type: none"> <li>- Project approvals, direction and oversight</li> </ul>

## 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, undertook significant work to advance the permitting process prior to award of the DBA. Section 'Permits and Approvals' in Appendix E, Responsibility Matrix, lists the permits, approvals and third party commitments required to implement the Project. The following sections provide brief descriptions of the main permits, approvals and third party requirements.

### 7.1 *EA Approval Conditions*

On October 14, 1998, the Minister of the Environment approved the EA for the NRHD submitted by Ontario Hydro (now OPG). Attachment A (referred to as Conditions of the EA 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.

The Responsibility Matrix only identifies applicable conditions. Because the EA was issued to Ontario Hydro (predecessor of OPG), OPG/OR is responsible to interact with MOE to obtain all necessary clearances of Conditions of the EA Approval. Certain of these conditions were cleared by MOE (Conditions 1.4, 1.6, 1.8, 2.1, 7.4, 7.5, 8.2, 10.1 and 10.2) prior to award of the original DBA. Other clearances required considerable involvement by the Contractor (in particular, Conditions 2.3.1, 3.1, 5.1, 7.2 and 9.4). The Contractor was provided with draft submissions made to MOE by OPG/OR, including all comments received from MOE, and was required to provide all relevant technical details needed to finalize the documents. The Contractor is required to attend meetings with MOE or other approving agencies to ensure all issues are addressed and to prepare material for OPG/OR to submit to MOE. Ongoing discussions are held with MOE as required. As the Project proceeds, amendments to approvals addressing EA Conditions or Minor Amendments to the EA may be required to address changing Project conditions.

EA Condition 4.2, groundwater monitoring, will require ongoing monitoring post-construction and this responsibility will be turned over to OPG.

### 7.2 *Community Impact Agreement (CIA)*

A CIA was concluded between the host 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 CIA was signed in September 2005 by all parties to reflect the phased approach to the NRHD. The CIA 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 in 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. This has subsequently been extended until December 31, 2014. OPG has confirmed that all major outstanding issues arising from the Section 35(2) Authorization have now been addressed. 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 have now met compliance monitoring required by DFO as part of the condition of approval, e.g., pre- and post-construction fish population studies 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 are 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**

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**

Section 'Permits and Approvals' in Appendix E, Responsibility Matrix, also lists other permits and approvals to be obtained. Most of these are related to construction activities and are the Contractor's responsibility. The Contractor must supply as-built drawings, pertinent close-out reports, etc, as required by any permits/approvals to the relevant agencies prior to turnover of the Project.

## **8 Execution and Delivery Strategy**

### **8.1 Project Phasing**

As indicated in Section 1 of this plan, the Project is being 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, and agreements with stakeholders.
- **Phase 2 (Design, Construction, Commissioning and Placing into Service Phase)** – Detail design and construction of the diversion tunnel and related works, commissioning and turnover of the tunnel facility and project closeout.

### **8.2 Project Resources**

The 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 before work normally done by this staff is contracted. 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 also allowed OPG to canvass the design creativity of the marketplace instead of being restricted to a single design, in order to optimize cost and schedule savings.

The ADBA includes a Target Cost and target in-service date. The contract includes incentives related to achieving the target cost and completion, and disincentives for failure to do so.

The procurement and contracting approach adopted for the other small contracts (Section 3.4.9) included in the Project follows OPG's current practices at the time of contract award.

### **8.4 Risk Allocation**

The ADBA has changed the risk allocation for the remainder of the Project. OPG has accepted risks for baselined items (extent of overbreak in the tunnel crown, escalation, diesel fuel price, etc) and for low probability, high consequence tunnel construction events (TBM main bearing failure, significant damage to the tunnel conveyor, tunnel flooding, etc). Close monitoring and



prompt response will be required to minimize impacts. Appropriate cost and schedule contingencies have been included in the superseding release.

### **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 Owners 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 substantial Letter of Credit in favor of OPG. 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.

The Contractor has also provided parental indemnities as additional security.

## **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 oversee execution of 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, turnover 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. The Responsibility Matrix in Appendix E provides details regarding functional responsibility.

### **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 Risk Oversight Committee (formerly 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 Management and Public Affairs. Liaison with the NPG is through a Single Point of Contact (SPOC) who in turn mobilizes NPG and Hydro Engineering involvement as necessary from time to time.

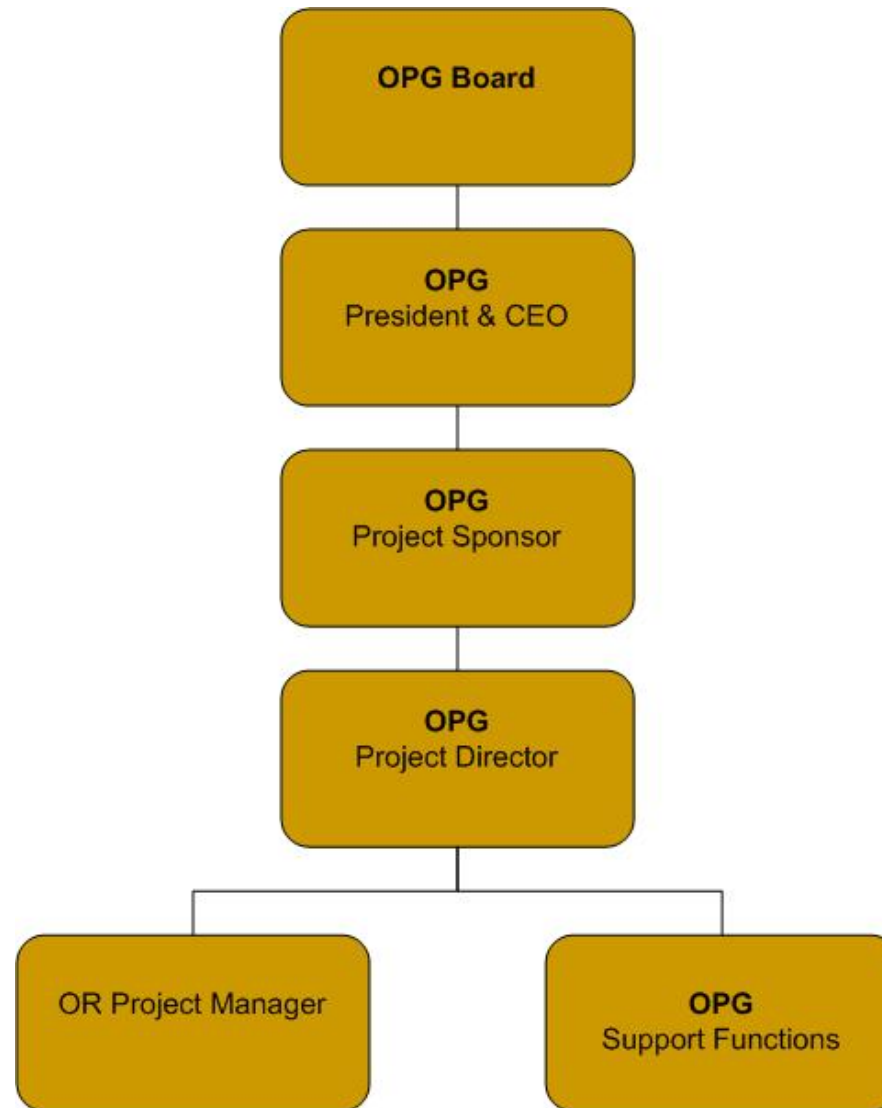
The OR team, led by the Project Manager, provides project and construction oversight services, project controls, environmental support and third party liaison. The OR team is also responsible for design review through the Engineering Manager with NPG/Hydro Engineering involvement in specific elements.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

#### ***9.4 Roles and Responsibilities***

Table 9.1 identifies the roles of the key project team members and provides a listing of their general responsibilities.

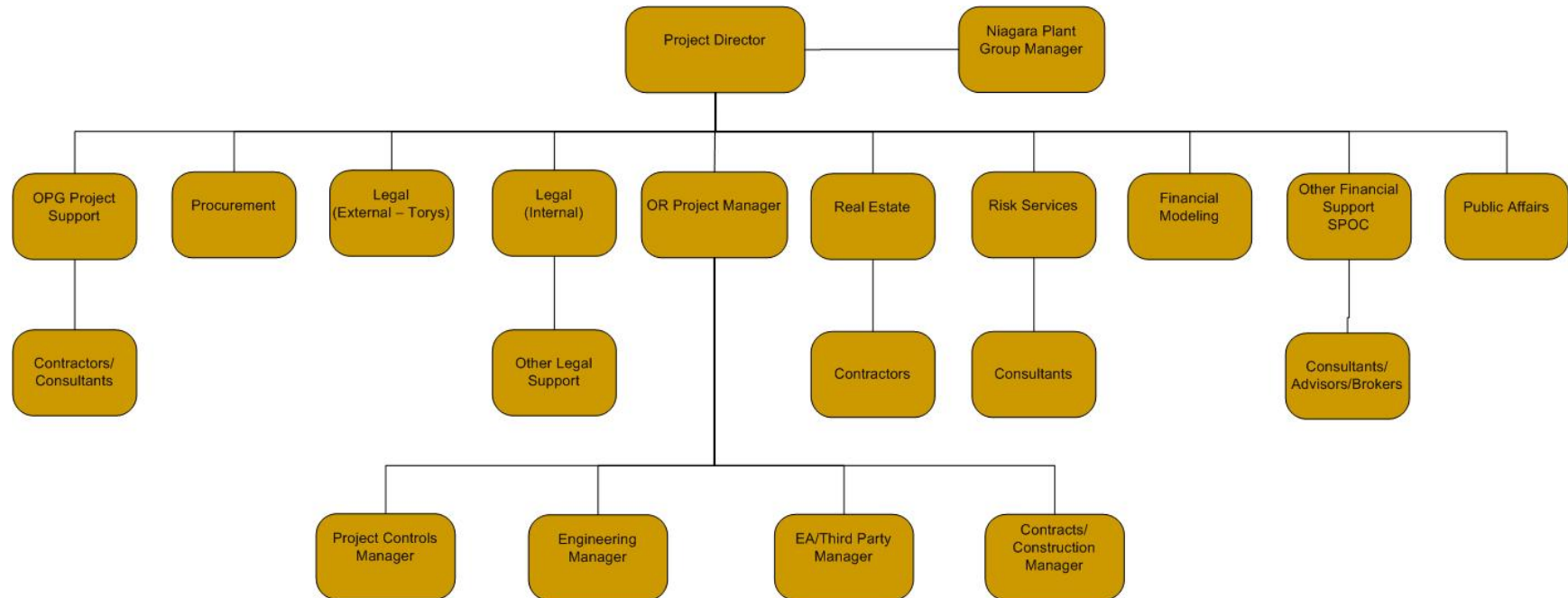
The Responsibility Matrix in Appendix E elaborates on the Project team members (positions / duties) and their responsibilities on the Project.

**Exhibit 9.1 – Summary Organization Chart – Phase 1**

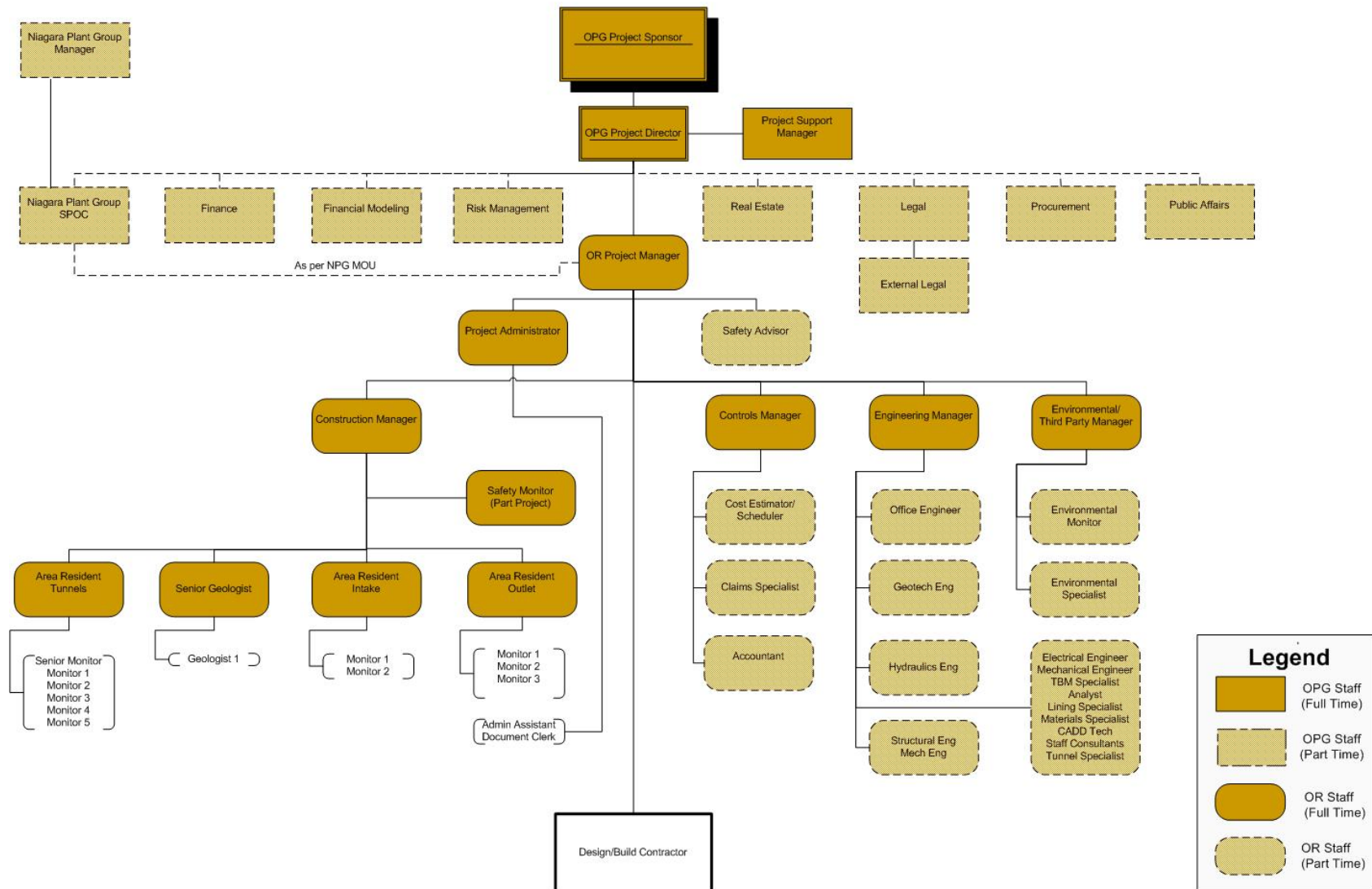


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### Exhibit 9.2 – Overall Project Organization – Phase 1



**Exhibit 9.3 - Summary Organization Chart – Phase 2 (ADBA)**  
**Niagara Tunnel Project - Phase 2 (Construction)**  
**Summary Organization Chart**



**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Board	Ontario Government	<ul style="list-style-type: none"> <li>• Establishes strategic objectives for the project</li> <li>• Approves project scope, budget and schedule</li> <li>• Provides oversight of advocacy and government relations activities</li> <li>• Monitors overall project performance</li> </ul>
OPG Major Projects Committee (prior to 2010Q2)	OPG Board	<ul style="list-style-type: none"> <li>• Overview of project execution approach and advice regarding planning and configuration of project</li> <li>• Overview of project team performance</li> <li>• Provides strategic advice regarding project delivery</li> <li>• Advises OPG Board on project delivery issues</li> </ul>
OPG Risk Oversight Committee (since 2010Q2)	OPG Board	<ul style="list-style-type: none"> <li>• Advises OPG Board on project delivery issues and risks</li> </ul>
OPG President & CEO (advised by Executive Management Team)	OPG Board	<ul style="list-style-type: none"> <li>• Provides senior management oversight</li> <li>• Provides guidance in terms of corporate direction, priorities and business drivers</li> <li>• Provides the project link to the OPG Board and shareholder (the Ontario Government)</li> </ul>
OPG Executive Vice President - Hydro	OPG President and CEO	<ul style="list-style-type: none"> <li>• Provides strategic direction &amp; senior management oversight</li> <li>• Steering Committee (SC) Member for OPG (per ADBA)</li> <li>• Manager of VP Hydro Development and Niagara PG Manager</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Project Sponsor (VP Hydro Development)	OPG President and CEO (Phase 1)/Executive Vice President – Hydro (Phase 2)	<ul style="list-style-type: none"><li>• Provides senior management oversight</li><li>• Issues the Project Charter</li><li>• Reviews and endorses PEP and Project Communication Plan</li><li>• Reviews project Risk Management Plan (RMP)</li><li>• Updates OPG Board/ Risk Oversight Committee/ Executive Management Team</li><li>• Facilitates funding approval</li><li>• Resolves OPG organizational impediments to project success</li></ul>



**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Project Director	OPG Project Sponsor	<ul style="list-style-type: none"> <li>• Accountable for the overall delivery of project in accordance with safety, environmental, cost, schedule, and quality objectives</li> <li>• Integrates OPG's work activities with those of the OR and other project participants</li> <li>• Reviews and facilitates approval of project cost estimates, budgets and timelines</li> <li>• Oversees negotiation of the tunnel Design/Build Contract and ADBA and any subsequent amendments</li> <li>• Develops responsibility matrix with OR project manager</li> <li>• Approves OR project delivery team</li> <li>• Ensures availability of appropriate OPG resources</li> <li>• Ensures adequacy of project reporting to meet OPG's requirements</li> <li>• Member of Change Control Board (CCB)</li> <li>• Facilitates communication between project team and other internal and external stakeholders</li> <li>• Oversees public communications efforts for the Project</li> <li>• Oversees liaison with external stakeholders</li> <li>• Ensures information distribution within OPG</li> <li>• Monitors ongoing performance of project participants (OR and OPG staff) and others</li> <li>• Oversees the preparation of the Business Case Summary (BSC) for project approval</li> <li>• Manages the execution of the Niagara Exchange Agreement work</li> <li>• Manages OR contract</li> <li>• Prepares Project Charter</li> <li>• Revises PEP, when necessary</li> <li>• Approves payment of contractor invoices</li> </ul>

**Table 9.1 – 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 – Hydro (Phase 2)	<ul style="list-style-type: none"> <li>• Identifies NPG requirements (as the internal OPG customer for the project)</li> <li>• Provides input to the project team regarding interface issues between the project and the NPG</li> <li>• Provides support to the project as required</li> <li>• Provides the project interface with local stakeholders</li> <li>• Response to any citizen complaints related to the Project</li> <li>• Signs off on physical characteristics depicted in the proposal invitation documents</li> <li>• Accepts the project facilities upon completion and meeting the Project quality objectives</li> <li>• Appoints a SPOC to provide day-to-day interface with the project team</li> <li>• Participates in team meetings as required</li> </ul>
Niagara Plant Group SPOC	Niagara Plant Group Manager	<ul style="list-style-type: none"> <li>• Provides a SPOC with the project team, representing the NPG</li> <li>• Facilitates /coordinates NPG input / review</li> <li>• Coordinates NPG support for the Project, as required</li> <li>• Represents the NPG at team meetings</li> <li>• Facilitates NPG sign off/acceptance</li> </ul>
Project Manager (OR)	OPG Project Director	<ul style="list-style-type: none"> <li>• Supports Project Director with respect to communications and government agency relations</li> <li>• Provides oversight and monitoring of the tunnel Design/Build Contract to facilitate achievement of the Project's safety, environmental, cost, schedule and quality objectives</li> <li>• Oversees project controls and reporting functions</li> <li>• Prepares initial version of the PEP</li> <li>• Supports the development of project Communications Plan and Contracting Strategy Approach</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
		<ul style="list-style-type: none"> <li>• Develops responsibility matrix with Project Director</li> <li>• Selects OR project delivery team</li> <li>• Manages and is responsible for the activities of the OR team</li> <li>• Oversees preparation of project cost estimates, budgets and timelines</li> <li>• Supports preparation and updating of the project RMP</li> <li>• Supports preparation of Project Risk Register and oversees its maintenance</li> <li>• Chairs Change Control Board (CCB)</li> <li>• Oversees preparation of project status reports</li> <li>• Review and acceptance of the original Design/Build Contract and preparation of all technical schedules to the original Design/Build Contract</li> <li>• Reviews bids and proposals and provides recommendation(s) for contract award</li> <li>• Supports negotiation of tunnel contract</li> <li>• Verification of third party invoices and Contractor applications for progress payments</li> <li>• Provides formal point of contact with Contractor</li> <li>• Reviews/recommends Contractor Request for Expenditures (RFE) exceeding \$100 K</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Project Support Manager	OPG Project Director	<p>Supports the OPG Project Director in the following areas:</p> <ul style="list-style-type: none"> <li>• Interface with the NPG &amp; Hydro Engineering on project matters</li> <li>• Facilitate project support from OPG groups as required</li> <li>• Coordinate/integrate internal OPG project requirements (e.g., business planning, budgeting, reporting, presentations, BCS preparation)</li> <li>• Conduct internal studies/reviews in support of the project</li> <li>• Act as OPG's representative in dealings with regulatory agencies as assigned (e.g., MOE meetings, re-use committee, etc)</li> <li>• Establish/communicate internal OPG requirements pertaining to the project (e.g., records management)</li> <li>• Act as OPG's primary contact for Team Building initiative</li> <li>• Participates in proposal/bid evaluations</li> <li>• Supports contract negotiations, as required</li> <li>• Health &amp; Safety oversight &amp; internal reporting</li> <li>• Environmental oversight &amp; internal reporting</li> <li>• Quality oversight &amp; internal reporting</li> <li>• Risk oversight &amp; internal reporting</li> <li>• Interface with OPG Internal Audit groups</li> <li>• Review/verification of OR billings</li> <li>• Acts as the Project Director delegate as required</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
Project Controls Manager (OR)	Project Manager (OR)	<ul style="list-style-type: none"> <li>• Responsible for establishing and utilizing appropriate procedures and systems to monitor, control and maintain project cost and schedule within set objectives</li> <li>• Development of project timelines</li> <li>• Development of project cost estimate</li> <li>• Preparation of overall project status reports</li> <li>• Provision of project cost data for input to OPG SAP system</li> <li>• Member of Change Control Board (CCB)</li> <li>• Contract manager for third party accountant</li> <li>• Review of third party invoices and Contractor applications for progress payments</li> <li>• Provides commercial contract administration for construction and other contracts</li> <li>• Develops and maintains project Action Tracking database</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
Engineering Manager (OR)	Project Manager (OR)	<ul style="list-style-type: none"> <li>• Overall responsibility for the engineering requirements of the project</li> <li>• Management of activities of OR engineering staff</li> <li>• Preparation of necessary engineering studies to support the project</li> <li>• Provides engineering support to OPG</li> <li>• Phase 1 <ul style="list-style-type: none"> <li>• Preparation of technical documentation for inclusion in contract documents</li> <li>• Administration of third party contract work</li> </ul> </li> <li>• Phase 2 <ul style="list-style-type: none"> <li>• Development and management of the design review process for the Contractor's submissions</li> <li>• Support preparation of cost estimates and schedules</li> <li>• Manage engineering support during tunnel construction</li> <li>• Manage and participate in submittal review process, including additional supporting engineering activities, work methods, testing, etc</li> <li>• Coordinate OPG NPG &amp; Hydro Engineering participation in design review</li> <li>• Support control, construction, quality, environmental and safety management</li> </ul> </li> <li>• Review the Contractor's commissioning procedures</li> </ul>
Construction Manager (OR)	Project Manager (OR)	<p>Phase 1</p> <ul style="list-style-type: none"> <li>• Provides support with regard to construction and constructability issues</li> <li>• Supports development of the project cost estimate</li> <li>• Supports discussions with regulatory authorities</li> <li>• Leads technical evaluation for proponent pre-qualification</li> <li>• Provides advice with respect to contract formation</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
		<ul style="list-style-type: none"> <li>• Supports development of concept design and proposal invitation with respect to construction and constructability issues</li> <li>• Reviews bids and proposals and provides recommendation(s) for contract award</li> <li>• Supports negotiation of design / build contract</li> </ul> <p>Phase 2</p> <ul style="list-style-type: none"> <li>• Organize and lead the construction oversight team to monitor the Contractor's compliance with the ADBA documents</li> <li>• Maintain liaison with the Contractor</li> <li>• Receive and coordinate timely review and return of Contractor submittals</li> <li>• Review the Contractor's construction and installation methodology and schedule submissions and monitor performance of the work against these documents</li> <li>• Review the Contractor's QA/QC program and results obtained</li> <li>• Monitor and report on the progress of the work including quantity of work performed, materials installed and manpower and equipment employed</li> <li>• Arrange for establishment of project survey control network and periodic survey audits of the work</li> <li>• Compile a substantial performance 'punch list' and review the Contractor's completion of the work and ensure all items are completed</li> <li>• Maintain a comprehensive photographic record of the progress of the work</li> <li>• Make recommendations for substantial and final completion certificate</li> <li>• Make recommendations as to validity of any changes requested by the Contractor</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
		<ul style="list-style-type: none"> <li>• Site Supervisor for INCW Part Project work</li> <li>• Coordinate with RMON on municipal road improvements under CIA</li> </ul>
Environmental/Third Party Manager (OR)	Project Manager (OR)	<ul style="list-style-type: none"> <li>• Provides the main point of contact between the project and the approving and permitting authorities with support from the NPG for local initiatives</li> <li>• Development and maintenance of the Permits/Approvals tracking database</li> <li>• Development of a timeline for obtaining of approvals and permits in a manner consistent with the project schedule</li> <li>• Identification of responsibilities for obtaining of permits and approvals</li> <li>• Coordinates transportation management plan and road upgrades/infrastructure requirements</li> <li>• Reviews environmental management plans</li> <li>• Submission of clearances for Conditions of EA Approval</li> <li>• Audit compliance monitoring and Contractor's environmental monitoring plans</li> <li>• Compliance with monitoring requirements for Fisheries Compensation Plan</li> <li>• Submission of annual compliance monitoring reports to MOE</li> <li>• Attendance at Liaison Committee Meetings and provision to committee of all compliance monitoring reports</li> <li>• Oversee monitoring/auditing of construction activities for environmental compliance</li> </ul>



**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
Safety Advisor (OR)	Project Manager (OR)	<ul style="list-style-type: none"> <li>• Provides advice, strategies and problem solving on health and safety matters</li> <li>• Promotes a culture where health and safety are a prime value that will never be compromised</li> <li>• Review Contractor's Project Site Specific Health &amp; Safety Plan and monitor compliance</li> <li>• Monitor Contractor's H&amp;S performance</li> <li>• Monitors the development, maintenance and implementation of the Project Safety Management plan in accordance with contractual requirements plus any Legislation applicable to the Project</li> <li>• Develops and implements OR staff training where required</li> <li>• Coordinates Project incident statistics and reporting for the OR</li> <li>• Monitors safety and health legislative requirements</li> <li>• Manages the project H&amp;S audit program</li> <li>• Regularly attends Contractor's toolbox meetings</li> </ul>
OPG Legal – External	OPG Legal -- Internal	<ul style="list-style-type: none"> <li>• Provides legal advice on risk allocation and commercial best practices</li> <li>• Preparation of the original Design/Build Contract, excluding technical schedules</li> <li>• Participates in proposal evaluations</li> <li>• Supports negotiation of tunnel contract and subsequent amendments</li> <li>• Provides/oversees specialty legal support (e.g., construction litigation, health and safety, environment, real estate, water rights)</li> <li>• Review of communications with third parties, as required</li> <li>• Provides general legal advice to the project, as required</li> <li>• Provides legal support regarding claims and disputes, as required</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Legal – Internal	OPG Project Director	<ul style="list-style-type: none"> <li>• Provides general legal and business assistance to the project</li> <li>• Provides/coordinates specialty legal support (e.g., construction litigation, health and safety, environment, real estate, water rights)</li> <li>• Participates in proposal evaluations</li> <li>• Supports negotiation of tunnel and other project contracts and subsequent amendments</li> <li>• Review of communications with third parties, as required</li> <li>• Legal support regarding claims and disputes, as required</li> </ul>
OPG Procurement	OPG Project Director	<ul style="list-style-type: none"> <li>• Support to all procurement activities required for project execution</li> <li>• Definition of applicable OPG Procurement Policies and strategies for the Project</li> <li>• Receives proposals</li> <li>• Coordinates preparation of proposal evaluation criteria</li> <li>• Participates in proposal evaluations</li> <li>• Supports negotiation of tunnel and other contracts and subsequent amendments</li> <li>• Administers OR contract</li> <li>• Issue purchase orders and amendments</li> <li>• Contractual support in the management of all OPG vendor contracts</li> <li>• Business and commercial support in the evaluation and resolution of claims</li> </ul>
OPG Finance – Financial Modelling	OPG Project Director	<ul style="list-style-type: none"> <li>• Conduct financial modeling/evaluations, as required</li> <li>• Participate in proposal evaluations</li> <li>• Support the preparation of project BSC for OPG Board approval</li> <li>• Evaluate financial aspects of proposed project changes</li> </ul>

**Table 9.1 – Key Roles and Overview of Responsibilities**

Position or Function	Reports To	Overview of Responsibilities
OPG Finance – Lead	OPG Project Director	<ul style="list-style-type: none"> <li>• Member of Change Control Board (CCB)</li> <li>• Provide/facilitate input/advice on Finance related matters (e.g., insurance, taxes, credit, bonding etc)</li> <li>• Support engagement &amp; administration of third party accountant</li> </ul>
OPG Finance –Support	OPG Project Director	<ul style="list-style-type: none"> <li>• Establish and maintain Project in SAP system</li> <li>• Review/audit of project cost data in SAP system</li> <li>• Identification of internal reporting requirements</li> <li>• Apply Goods Receipt status for payment of invoices approved by project team</li> <li>• Provide/facilitate input/advice on Finance related matters (e.g., insurance, taxes, credit, bonding etc)</li> <li>• Input purchase requisitions &amp; contract changes</li> </ul>
OPG Real Estate	OPG Project Director	<ul style="list-style-type: none"> <li>• Identification of real estate acquisition requirements for the Project</li> <li>• Negotiation and acquisition of real estate required for project execution</li> <li>• Provision of legal surveys and property plans</li> <li>• Administer contracts for property acquisition surveys</li> <li>• Negotiate contracts for third party property acquisition</li> </ul>
OPG Risk Management (formerly Risk Services)	OPG Project Director	<ul style="list-style-type: none"> <li>• Prepares project Risk Register (Phase 1)</li> <li>• Supports and reviews maintenance of Risk Register</li> <li>• Provides risk-related advice to project team</li> <li>• Develops and maintains Key Risks Table</li> </ul>
OPG Public Affairs	OPG Project Director	<ul style="list-style-type: none"> <li>• Develop and implement plans for project related communications to the public and OPG employees</li> <li>• Coordinate response to major public/media inquiries in consultation with NPG and OR</li> <li>• Organize public events in consultation with NPG and OR, as needed</li> </ul>

## 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.

Substantial contingency allowances are included in the superseding approved Business Case and some purchase orders. Allocation of project contingency is accomplished through completion of the current project Budget Transfer Authorization forms with appropriate sign-off by OPG Finance and Senior Management as outlined on the form.

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## 11 Schedule and Milestones

The initial schedule used for calculating target dates for the ADBA was developed in graphical format with time (vertical axis) plotted against chainage (horizontal axis), known as a Time/Way diagram, for each major activity progressing through the tunnel based on production rates derived from historical data or projected rates based on experience.

The ADBA target schedule was then negotiated by the Contractor and OPG based on alternative versions of the Time/Way diagram, and was ultimately approved by the OPG Board of Directors. The Target Schedule is included in Appendix F. For more details, see Section 13.

The ADBA target schedule contains key target dates set for the successful execution of the Project, as listed below:

Activity	Date
<b>Phase 1</b>	<b>Actual Date</b>
Issue Expression of Interest Documentation	July 21, 2004
Receive Expressions of Interest	August 26, 2004
Issue Proposal Invitation Documents	December 22, 2004
Receive Tunnel Design/Build Proposals	May 13, 2005
Board approval	July 28, 2005
Tunnel Contract Start Date	September 1, 2005
<b>Phase 2</b>	<b>Target Date</b>
Project Completion and Closeout	December 31, 2013 (non-contractual)

The summarized ADBA Target Schedule includes the major construction activities as provided below. The detailed version is maintained in Primavera Project Management format.

100

Blue – Not on Critical Path  
Red – Critical Path

## 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 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 “Diversion Tunnel” only as an example.

### 12.2 Cost Estimate (Phase 2)

The revised Cost Estimate for the Project (the amended RQE) follows the CBS described above.

The Cost Estimate incorporates the ADBA target cost, Third Party costs including agreed payments under the CIA, agreed compensation paid for Welland River issues, Other Contracts costs (OCIP, etc), Niagara Exchange Agreement (OP, TP and future water rights) costs, Professional Services costs including OR, OPG direct costs, and contingency to address remaining project risks.

The Cost Estimate is developed and updated in a monthly cost 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 Superseding Project Budget. This now defines the upper limit cost for completion of the Project scope within the Project schedule.

The Basis of Estimate is founded on the clear statement and purpose for which the estimate has been prepared, clearly identifying and providing cost details based on the following:

- 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 notes any specific inclusions or exclusions to the estimate.

The summary of estimate provides a cost flow and total estimate information for each major work package or cost.

### ***12.3 Target Cost***

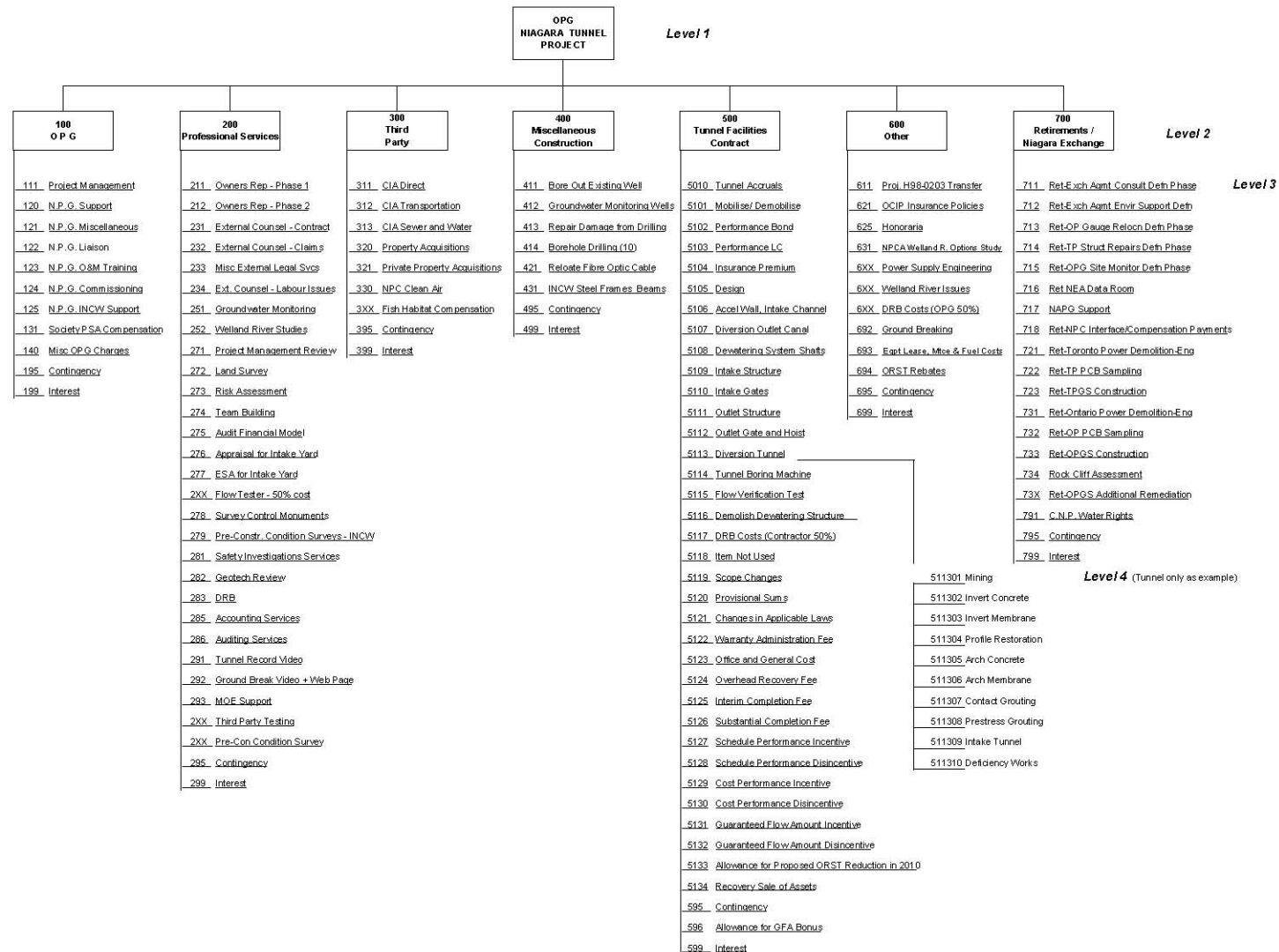
After receipt of the recommendations of the Dispute Review Board, OPG and the Contractor negotiated an ADBA that converted the original fixed price contract to a target cost contract. The negotiated and agreed Target Cost was based on a target schedule previously negotiated by the Parties.

#### **12.3.1 Adjustments to Target Cost**

The Target Cost may only be adjusted if one or more of the events listed in Section 5.1A of the ADBA occurs, in which case such adjustment will be made through the Project Change Directive (PCD) protocol and will be incorporated into the ADBA by way of an amendment. Any PCD affecting Contract Cost, Target Cost or Contract Schedule requires review and endorsement by the CCB and approval by the Project Sponsor.

Niagara Tunnel Project  
 Project Execution Plan

Exhibit 12.1 – Cost Breakdown Structure



Note: Retirements are addressed in a separate PEP.

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## 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 have in place a set of procedures that clearly define the requirement of the Project controls process. For more detailed information, refer to the OR Policies and Procedures Manual, Project Controls (AM0001-R00). The following is only a high level summary of these procedures.

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 (Coordination) Schedule by OR
- Level 3 – Production Schedules by Contractors (Baseline and Progress).

Internal OPG Project schedules (produced by the OR) 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 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 ADBA goals if schedule slippage occurs.

#### 13.2.2 Contract (Baseline) Schedules (Level 3)

- The detail baseline contract schedule has been prepared by the Contractor in Primavera Project Management (current release), using Gantt chart format and includes all of the information from the Time/Way diagram as well as all other non-linear activities not included in the latter. Logic is included to enable analysis of the critical path(s). OR reviewed/commented on the detailed schedule before the parties agreed the formal baseline version that forms the basis for schedule reporting and analysis. The ADBA baseline schedule is included in Appendix F.

#### 13.2.3 Progress Schedules (Level 3)

- A monthly progress schedule is provided by the Contractor showing progress to date compared to the baseline, a recalculation of the critical path(s) and the currently anticipated Substantial Completion Date and Final Completion Date. This is reviewed by the OR and any necessary revisions made before acceptance.

- Weekly Progress is recorded by the OR on the Time/Way diagrams to give more timely reporting of progress and variation (positive or negative) from the baseline.
- Schedule Performance Indices (SPIs) are calculated by the OR on a monthly basis to show in tabular format the efficiency of the time spent on the various operations to date.
- Analysis of results are performed monthly by the OR, or at such more frequent interval as may be necessitated by apparent large variations. Reporting includes performance to date (SPI), trends (positive or negative).
- Progress Schedules show the sequence and interdependence of all tasks required of the contractor or consultant.
- Progress Schedules are reviewed for compliance with the ADBA by the Construction Manager, the Engineering Manager and by the Project Controls Manager.
- A detailed forecast of the schedule to complete the Project will be prepared by the OR at least twice per year in January and July and submitted to the Project Director.

#### 13.2.4 Adjustments to the Contract Schedule

- The Contract Schedule may only be adjusted if one or more of the events listed in Section 5.1A of the ADBA occurs, in which case such adjustment will be made through the Project Change Directive (PCD) protocol and will be incorporated into the ADBA by way of an amendment. Any PCD affecting Contract Cost, Target Cost or Contract Schedule requires review and endorsement by the CCB and approval by the Project Sponsor and other OPG senior management in accordance with the OAR and Budget Transfer Approval process.

### **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 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, appropriate amounts of contingency and escalation will be included.

#### 13.3.2 Committed Values

- 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.

#### 13.3.3 Project Cost Estimate

- The baseline or “budget” for Project Cost Management is based on the approved Project Cost Estimate (RQE) 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 is made to Level 3 of the Project Cost Estimate.
- Cost forecasting is performed by the Project Controls Manager on a monthly basis based on the Contractor's estimate of the next month, combined with Project team knowledge and expertise.
- A detailed forecast of the cost to complete the Project will be prepared by the OR and submitted to the Project Director at least twice per year in January and July.

#### 13.3.4 Incurred Costs

Costs are categorized as either an Allowed Cost or a Disallowed Cost. An Allowed Cost means each cost that is not a Disallowed Cost and is incurred by the Contractor in the performance of the Work, including actual cost invoiced to the Contractor by the Subcontractor as per executed contractual agreements between parties. A Disallowed Cost is any cost arising from a very specific list of negotiated entities listed in the ADBA:

- 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 Indices (CPIs) based on earned value measurements derived from Allowed Costs and progress schedule updates will be calculated and reported monthly.
- Estimated final costs will be estimated monthly or at major occurrences and these will also be compared to package budgets.
- A more detailed and substantial recalculation of estimated final costs will be performed every 6 months or at times of substantial variance to the originally contemplated cost flow.
- 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 reassessed. Such potential scope adjustments will be referred to the OPG Board for approval.

#### 13.3.5 Invoice Approval

The Niagara Tunnel Project (NTP) team has the responsibility to ensure that all costs invoiced by the Design Build Contractor and other vendors are legitimate project costs. The Project Director has the final accountability in this regard.

The Project Director and OPG will rely on the OR to verify that invoices submitted by the Design Build Contractor, and other vendors administered by the OR on behalf of OPG, accurately reflect compensation owing under the associated contract terms for the work performed during the invoiced period.

OPG has engaged the services of the OR to oversee many aspects of the tunnel project. The OR was extensively involved in negotiation of the DBA and the ADBA. With the change from a fixed price contract to a target price contract, increased effort is required during review of the Contractor's invoices to ensure that costs are legitimate and that only Allowed Costs are reimbursed to the Design Build Contractor. An external accountant has been engaged by OPG to

assist the OR in review and verification of the payment claims by the Design Build Contractor. The external accountant will coordinate with the OR to identify specific items for review (e.g., potential Disallowed Costs, new subcontractors, etc) and will review sufficient samples of the Contractor's supporting documentation (payroll, subcontractor invoices, etc) to validate monthly invoices including reconciliation of estimated amounts included in the previous monthly invoice all in accordance with the current engagement terms.

OPG will arrange for periodic audit of Design Build Contractor and possibly other vendors as appropriate considering the value, risks, etc relative to ongoing contracted work.

### 13.3.6 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, all Applications for Payment by the Design Build Contractor, and other vendors administered by the OR on behalf of OPG, will be submitted in draft form to the OR for review before final submittal.
- The Project Director will review OR invoices and invoices of all other Project vendors not administered by the OR.
- Payments will be made in accordance with corresponding Purchase Order conditions.
- All Applications for Payment under the ADBA will be made based on the Allowed Costs gathered in the Contractor's books of accounts. This requires an analysis of those accounts by OPG/OR on an ongoing basis to verify the validity of the requested payments in the Contractor's monthly invoice. There will be a monthly detailed review conducted by a third party accountant engaged by OPG (i.e., OR Accountant). The hired OR Accountant will also initially assist in identifying and setting up the Contractor's new accounting system to handle the additional demands of the ADBA.

## 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, the 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 and, in more detail, in the OR Policies and Procedures Manual.
- 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 Purchase Order) documents, shall be referred to the Project CCB for review, potential revision and recommendation of approval, before proceeding to the person or entity having appropriate authority level for such approval.

#### 13.4.2 Change Control Board

- The CCB will consist of
  - OPG Project Director
  - OPG Director of Finance, Hydro
  - OR Project Manager (Chairperson)
  - OR 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 as required at times determined by the chairperson after consultation with the other members.
- 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 (PCD/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 (PCN).

#### 13.4.4 Project Change Directives

- PCDs shall be formalized on a standard PCD template as per Appendix 1.1(hhh) of the ADBA.
- Any expected adjustment to the Target Cost (or Purchase Order) 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.
- PCDs will be signed by the person or entity in OPG having the appropriate level of signing authority.
- All parties involved in issuing a PCD 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 ADBA shall be formalized on the template specified in the ADBA.
- Any adjustment to the Target Cost (or Purchase Order) 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 to be unambiguous at law.
- 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 EVP Hydro (or delegate) on behalf of OPG and documented by an amendment (Instruction Notice [IN]) to the purchase order. The format of the IN shall be the OPG standard format.
- An updated and conformed ADBA document will be maintained by the OR incorporating all Amendments to date. This document will be updated each time significant changes should be incorporated to make the document relevant and easily usable.

#### 13.4.6 Project Change Directives as Amendments

Where a change in the Work, Target Cost or Contract Schedule is not the result of a change in Applicable Laws, and where there is no change in the Contract Schedule, and where any change in Target Cost is less than [REDACTED], a PCD, when signed by both Parties, will be deemed to be an Amendment to the ADBA and no further or additional written agreement is required. Such amendments will also require a complementary amendment to the Purchase Order.

#### 13.4.7 Changes To Other Project Contracts

- For major scope changes prior to entering into a contract or purchase order, a process will be followed similar to the above.
- Changes, if necessary, to any other Project contracts or purchase orders will be undertaken with the knowledge of the CCB and following current OPG procurement practices.

### 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 have been established and will be updated as necessary.
- Estimated final costs and cash flows of all contracts and purchase orders will be estimated monthly and a full reforecast calculated at least semi-annually (in January and July).
- All schedules will be updated monthly.
- Distribution lists for weekly and monthly reports will be developed by the OPG Project Director.
- Daily tunnel excavation reports are emailed to a defined list of OPG staff.

### 13.6 Claims Management

- Any notice of claim for a change to the Target Cost or extension to the Contract Schedule received from any contractor or consultant will be formalized on the standard PCN set out in the ADBA. It will immediately be referred to the members of the CCB 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 Steering Committee (SC) for informal resolution.
- No claims will be referred to the SC without prior CCB review and recommendation and without an attempt to negotiate a settlement at the Project Manager level.
- Small claims not exceeding the threshold values referred to 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.

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Attachment 1 (NON-CONFIDENTIAL)

## 14 Risk Assessment and Risk Management

### 14.1 Overview

Major projects generally face significant technical and other challenges during their planning, design, construction, and commissioning phases. Effective risk management is critical to the success of these projects and will allow for informed communication with project stakeholders such as owners, funding partners, insurers, designers, contractors, and the regulatory authorities, with regard to issues and expectations.

The Risk Management Plan (RMP) documents how risk management will be performed for the Project. It documents the roles and responsibilities for project team members, the methodology and tools used, the budget and schedule for risk management, contingency assessment, and integration with project approval processes.

The OPG risk management process used for the Project is based on a standardized methodology as detailed in Project Risk Management, OPG-PROC-0025, and is consistent with industry best practices. In summary, the risk management process consists of the following activities:

- Risk Identification
- Risk Assessment
- Risk Treatment
- Risk Monitoring.

It is important to note that the risk management process is iterative, so as the project progresses, the RMP and corresponding documents (e.g., key risk plan and risk registers) continue to be updated.

The documents which will be used to carry out the risk management process are as follows:

- Risk Management Plan (RMP)
- Execution Phase Business Case Summary (BCS)
- Execution Phase Project Execution Plan (PEP)
- Monthly Reports
- Key Risk Plan
- Risk Registers.

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## 15 Engineering Management Plan

### 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 consists of

- engineering, scheduling and manpower allocation
- attendance at Contractor design meetings and other meetings as required by the Project
- review of Contractors' submittals and additional engineering to support such reviews
- support to contractual, schedule and cost estimates and reviews
- site support for construction quality and contractual compliance
- site geotechnical support
- obtaining outside expert advice or employing additional services as required
- assistance on site as required.

The majority of the OPG/OR engineering effort for Phase 2 of the work will consist of technical review of Contractors' submittals. Review of the submittals will include, as necessary, independent engineering analysis to confirm the Contractor's design analysis of the tunnel lining system, hydraulic analysis of the conveyance system, structural checks of various components and geotechnical analyses, and will include OPG staff involvement, for specific elements of the Project, as agreed with the Project Director.

Resourcing will be on an as-required basis using the various resources of the OR. Full-time presence by the OR Engineering Manager at site will be provided as required. Submittal review and review of other information provided by the Contractor will be on the Contractor's schedule within the review requirements of the contract.

## **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 coordinate the submittal process with the Contractor and have suitable staff available for reviews in a reasonably short period of time.

In Phase 1, each proponent contractor included the following key submittals with their proposals. Following selection of the Contractor, such submittals were included as appendices to the DBA and ADBA:

- 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 (incorporated through negotiations into GBR-C)
- Outline Specifications
- Draft Drawings
- TBM Description.

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

- 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 DBA and ADBA.

## **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
Amended 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 individuals who are 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 OR 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 how they may relate to the permanent Works and for compliance with the ADBA, in particular, the Owner's Mandatory Requirements. Some detailed designs must also be reviewed by OPG/ NPG/ Hydro Engineering, specifically those pertaining to intake and outlet gates, hoists and associated mechanical, electrical and control 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 ADBA. Signing off a submittal as "Reviewed" means that the submittal becomes a "Final Submittal" which will be deemed to be incorporated into the ADBA.

Comments resulting from the review(s) of a Contractor submittal will be consolidated by the assigned submittal Champion and marked on the return submittal and signed by an authorized signatory in accordance with project procedures. The authorized signatory means the OR Engineering Manager or qualified professional designated by the OR 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 communications 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** – this category shall not be used as it leaves the document in limbo as to whether it is a “Final Submittal” or not
- **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 permanent 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. Individual marked up copies of the submittals will not be retained. Submittals that no longer require review and have been returned to the Contractor as “Reviewed as Submitted” will become “Final Submittals” and will form part of the ADBA.

## 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 committed that the tunnel will be driven by a 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 SAB PGS. Excavated spoil will be stored 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 leased from NPC. Excavated spoil from the Intake in-water work is trucked to a suitable location for recovery of reuseable material. Excavated rock from the Intake channel and grout tunnel is crushed at the Intake site for reuse as aggregate on the Project or local public projects.

As added contingency for air quality reasons, a ventilation shaft has been constructed at CH5+318 with a temporary surface housing located within OPG lands adjacent to Stanley Avenue near Valley Way.

The tunnel is being excavated by a 14.44-m diameter open gripper TBM with initial support lining installed from the TBM trailing gear. The initial support lining will vary along the tunnel length, depending on rock conditions encountered but will generally consist of a combination of rock dowels, steel mesh, steel ribs and shotcrete. The final lining will include installation of a waterproof membrane, and a minimum 600 mm thick cast-in-place unreinforced concrete lining that is subsequently pre-stressed by high pressure grouting. There are some areas of the tunnel with significant crown overbreak which will require infilling prior to the placement of the arch portion of the final tunnel lining. An operation to restore the tunnel crown to a circular shape is being used to rectify areas of overbreak and restore the tunnel to a circular cross section required for installation of the tunnel membrane and the final lining. Due to schedule impacts resulting from overbreak, concurrent operations including tunneling, final tunnel lining, overbreak infill / profile restoration, contact grouting and prestressing are anticipated at various stages of the Project.

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

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

- BMTI/Baystag (Austria/Germany) for design, manufacture and supply of the main structural components for the Invert and Arch carriers and shutters. Baystag provided the design for the Restoration Carrier with manufacture and supply of the main structural components by Burnco (Markham, ON).

In terms of OHSA, the Contractor is the Constructor for the Project except for the INCW Part Project work where OPG, represented by the OR, is the Constructor.

The Contractor has prepared a Quality Manual to describe their Quality System, which is in accordance with the requirements of ISO 9001, and consists of processes and procedures to provide a controlled review of the Quality Control Process and associated records on a daily basis. It also includes random reviews/inspections of workmanship to confirm that QC tasks have been completed.

Pre-construction enabling work completed includes

- implementation of a Groundwater Monitoring Program (Genivar, formerly Jagger Hims)
- right of way survey/subsurface property expropriation (Larocque)
- installation of Survey Control Monuments (Monteith & Sutherland)
- roadworks by RMON under the CIA
- provision of sewer and water connection stub-ends by RMON/City of Niagara Falls under the CIA.

Prior to Contract Completion, post construction work will include decommissioning of specified gas, electrical, telecom, sewer and water connections installed for construction of the Project.

Pre- and post-construction inspections of the INCW structure and gates, and the PGS structure are performed by a third party engineering consultant hired by OPG with oversight by the OR.

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 OR Construction Manager reporting to the OR Project Manager. Forms utilized for recording daily work activities, Quality Audits of Contractor operations and detailed progress summary sheets of work activities are included in the OR Project Policies and Procedures Manual.

Designated teams will be responsible respectively for monitoring of the

- Intake and Outlet Works
- Diversion Tunnel
  - TBM Mining
  - Invert Concrete Lining, including membrane
  - Profile Restoration
  - Arch Concrete Lining, including membrane
  - Contact Grouting
  - Prestress Grouting
- TBM manufacturing facility
- Trailing gear manufacturing facility
- Gate and hoist manufacturing facility
- Dewatering shaft liners
- Precast concrete elements.

Monitoring staff will be engaged to ensure coverage of all construction shifts. In particular, monitoring of TBM tunnelling and final concrete lining will be provided on a full-time basis during each and every production shift. With the introduction of concurrent operations, monitoring at other work locations (e.g., profile restoration) will be on a part-time basis deploying OR staff shared with other activities in the tunnel.

In terms of the ADBA, overbreak is measured on a frequent basis and provision is made in the ADBA for adjustment of the Contract Schedule and Target Cost in the event that actual crown overbreak values exceed the target overbreak amount.

A primary site office for the OR has been established in the site office compound at the Outlet Works and a satellite office has been established at the Intake Works. Management of the OR site office will be the responsibility of the OR. Trailers for use by OR staff are provided by the Contractor at operations within the tunnel.

#### 16.2.2 Key Tasks

The OR Construction Management team will be responsible for the following key tasks:

- Health and Safety of OR's Staff
- Health and Safety Management 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
- 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
- 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 OR Construction Management team will provide close support to the following OPG/OR activities:

- Project Controls
- Cost Controls
- Risk Management
- Submittal Review
- Public Communications
- 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**

Key construction activities are summarized in Section 11.

### **16.4 Testing and Commissioning**

#### 16.4.1 Testing

##### **Quality Control Testing**

Quality control/assurance and testing will be the responsibility of the Contractor. The Contractor has prepared a Quality Assurance/Quality Control Plan to ensure that the quality of the final Works meets the specifications and intent of the designers, including the 90-yr maintenance free service life. OPG, through the OR will audit the quality control and assurance program and the work for contractual compliance. OPG has maintained the right to engage independent testing agencies to assist in the quality audit.

##### **OR Monitoring Overview**

The objective of the construction Monitoring Program is to ensure that facilities are constructed in conformance with contract requirements and complete records of as constructed facilities are provided.

The OR has assembled detailed monitoring reports, preplacement inspection reports and audit checklists to assist with the monitoring of the Contractor's Quality Assurance/Control program. All Contractor activities dealing with permanent works are typically audited prior to 'covering'

(e.g., prior to concrete, backfilling, etc) to confirm that the Contractor is performing the necessary quality control to ensure compliance as the work advances. If the OR determines or finds work that is inconsistent or non compliant with contract specifications or the Contractor's Quality Assurance/Quality Control Plan, the Contractor is immediately advised verbally and joint sign-off of the Contractor's preplacement form is "not agreed" until the necessary corrections are made. If a particular inconsistency related to Quality Assurance is noted and not corrected prior to advancing the work, a Quality Assurance Non-Conformance Notice (NCN) will be issued by the OR or the Contractor. Additionally, a Disallowance Advisory may be prepared as outlined in the ADBA advising the Contractor that future non-conformance will result in a Disallowed Cost.

Task specific construction monitoring procedures and examples of OR monitoring reports and checklists are provided in the Project Policies and Procedures Manual. Additionally, all progress related to permanent Work is included in the monitoring database maintained by the OR.

### **Factory Testing**

The 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, precast concrete elements, dewatering shaft steel liners, Intake and Outlet gates. 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 Facility Project will be carried out after achievement of substantial performance and after the tunnel has been watered up. Commissioning will include

- progressing through startup and closing and opening sequences of the outlet gate
- 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
- verification of contract compliance
- validation and demonstration of system performance
- as-built system drawings, operating and maintenance manuals, commissioning record manuals, inspection and verification certificates and guarantees.

Commissioning of the new accelerating wall located upstream from INCW Pier 5 has been completed. Operation drawings, maintenance manuals and training for the use of the accelerating wall travel restraint system were provided to OPG/NPG on September 27, 2007.

A detailed commissioning and turnover plan will be developed and will be based on the construction schedule submitted by the Contractor. The plan will include the objectives of system testing and specific responsibilities of the various members of the OR management team and OPG in performing or observing key elements of the commissioning program.

Demobilization of facilities and site restoration plans will be developed by the Contractor to ensure all areas of the site disturbed by the Contractor are restored in accordance with the ADBA and the Contractor's Environmental Management Plan, including OPG lands at the SAB complex, lands leased from NPC at the Intake area, the temporary ventilation shaft, site, piezometer sites, inclinometer sites and any other areas disturbed by the Contractor during execution of the Work.

## 17 Environmental Oversight Plan

### 17.1 Overview

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.

It is the Contractor's responsibility to carry out the Project in compliance with all applicable laws and its Environmental Management Plan. The OR will monitor the Contractor's activities for compliance.

### 17.2 Phase 1 Activities

Environmental issues addressed prior to DBA 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 DFO compensation plan and monitoring plan requirements were advanced by the OR Environmental/Third Party Manager.

### 17.3 Phase 2 Activities

A detailed Environmental Management Plan was developed by the Contractor after DBA award, based on the outline plan submitted by the Contractor. The Plan has two components—protection and compliance. The components of the Plan identified as the Contractor's responsibility are a contractual requirement. It will be the Contractor's responsibility to complete periodic self-assessments for compliance with the plan, and provide OPG/OR with a copy of the self-assessment findings, to confirm plan implementation throughout the Project.

#### 17.3.1 Environmental Protection

A number of elements for environmental protection were identified in the Contractor's Environmental Management Plan and were subsequently developed in detail by the Contractor. These included 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 are 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 had to be submitted and approved by the regulatory agencies prior to the commencement of construction. The OR is responsible for monitoring the Work for compliance with accepted plans.

### 17.3.2 Environmental Compliance Program

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

The program identifies 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 that are the responsibility of the Contractor and all reporting requirements to OPG/OR and the Authorities having jurisdiction were clearly identified.

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 CIA.

A Communications Procedure for Non-Emergency Situations (MOU-0001-R00) has been developed to address all complaints from the public. The procedure has received 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  City of Niagara Falls/ 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	At least 6 months prior to completion of each component of the Project	OR
14. Certificate of Approval (Industrial Sewage) – Water Treatment Plant	Contractor	Prior to construction	MOE
15. Certificate of Approval (Air) – Concrete Batch Plant	Contractor/ Subcontractor	Prior to construction	MOE

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<b>Environmental Protection</b>	<b>Responsibility for Documentation</b>	<b>Submission Date</b>	<b>Agency</b>
16. Permits to Take Water - Intake - Outlet Canal - Tunnel	Contractor	Prior to withdrawals	MOE

## 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 developed by OPG Public Affairs for approval by the OPG Project Director; the latter is 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 CIA.

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 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/NPG 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 is 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 CIA 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 CIA. The citizen complaints procedure will be simple and responsive. For example, a telephone and e-mail 'hot line' that is monitored regularly 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 NPG 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 CIA.

### 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 OPG Project Director as required, involving key Project team members to define the scope of work and establish baseline budgets and schedules for future work
- weekly progress meetings, convened by the OPG Project Director, involving key Project team members to review performance and facilitate OPG / OR coordination
- recap meetings, convened by the OPG Project Director at appropriate points to review lessons learned, and implement identified improvements

- Site coordination meetings (during Phase 2) at a frequency of not less than twice per month, 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 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.

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 with the exception of media inquiries.

### **18.2.1 Media Inquiries**

The OPG Media Desk can communicate directly with the Contractor when dealing with time sensitive real-time media issues.

The Contractor will contact OPG Media Relations before responding to media to determine who will respond and talking points.

OPG Media Relations is available 24/7 at 416-592-4008.

OPG Media Relations, the Contractor and the OPG Project Director will work together to address media inquiries in a timely manner.

The OR and the OPG Project Director will be informed of any such direct communications between the Contractor and OPG Media Relations.

### 18.2.2 Emergency Notifications

The OR or the Contractor will notify OPG Media Relations when fire, ambulance or police services are called to the Project site.

## 18.3 Team Building

OPG proposed a voluntary team building program for the Project. The ADBA 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

An off-site team building session was held with key staff of OPG, OR and the Contractor in January 2006 as part of the voluntary team building program encouraged in the DBA and ADBA. The purpose of the session was to improve communication between all parties, and to facilitate problem solving, conflict avoidance and issue resolution. Follow-up workshops, events, activities, etc, are being held periodically as agreed to by the Contractor and OPG/OR.

#### ***18.4 Confidentiality Agreements***

Project specific Confidentiality Agreements are in place with the OR, subcontractors and other vendors engaged by OPG for work on the Niagara Tunnel Project. OPG participants are bound by OPG's Code of Business Conduct. The Design Build Contractor and their subcontractors are bound by Confidential Information provisions in the ADBA.



**Table 18.1 – Project Communications Plan – Phase 1**

Stakeholder	Information	Frequency	Methodology	Responsible
Board	<ul style="list-style-type: none"> <li>High level performance metrics</li> <li>Key external issues</li> </ul>	Quarterly	Meeting and Presentation Meeting Handout Board Memo	Major Projects Committee/ Project Sponsor
Major Projects Committee	<ul style="list-style-type: none"> <li>High level performance metrics</li> <li>Key external issues</li> </ul>	Weekly (Memo) Quarterly	Memo Memo/Verbal/Presentation	Project Sponsor/ Project Director
Project Sponsor	<ul style="list-style-type: none"> <li>Cost, schedule, safety, environmental and quality reports</li> <li>Issues/concerns and Actions</li> </ul>	Weekly	Verbal Status Report	Project Director
Project Team	<ul style="list-style-type: none"> <li>Cost and schedule metrics</li> <li>Issues and Actions Report</li> <li>Work ahead</li> </ul>	Weekly	Team Meeting Minutes of Meeting	OR Project Manager
Approving Agencies	<ul style="list-style-type: none"> <li>Approvals status list</li> <li>Approvals schedule</li> </ul>	Bi-Weekly and Monthly	Minutes of Meeting	OR Environmental and Third Party Manager
Niagara Plant Group	<ul style="list-style-type: none"> <li>Technical documentation</li> <li>Stakeholder issues</li> </ul>	Bi-Weekly	Meeting	Project Manager

**Table 18.2 – Project Communications Plan – Phase 2**

Stakeholder	Information	Frequency	Methodology	Responsible
OPG Board / Risk Oversight Committee (ROC)	o Written / verbal update at each Board/ROC meeting	Quarterly	Verbal Status Report	EVP Hydro
	o Written Major Projects Status Report including cost and schedule metrics	Quarterly	Written Report	EVP Hydro
OPG Executive Management Team	o Written report and verbal update	Weekly	Verbal Status Report	EVP Hydro
	o Written update at the OPG Key Results meeting	Monthly	Written Report	
	o Monthly Report – Executive Summary distributed to EMT	Monthly		Project Sponsor
EVP Hydro	o Cost, schedule, safety, environmental, key risks and quality reports	Weekly	Verbal Status Report	Project Sponsor
	o Issues/concerns and Actions			
Project Sponsor	o Cost, schedule, safety, environmental, key risks and quality reports	Weekly	Verbal Status Report	Project Director
	o Issues/concerns and Actions			
Project Director	o Project report including cost/ schedule/ quality/ environmental/ safety performance of project	Monthly	Written Report	OR Project Manager
	o Summary reports covering project activities and status action tracking list	Weekly	Written Report	
Project Director	o Summary reports covering project activities and status action tracking list	Weekly	Report	OR Project Manager
Project Team	o Design & Construction progress	Weekly	Team Meeting	OR Project Manager
	o Issues and Actions Report		Minutes of Meeting	
	o Outline of planned work		Action Items	
	o Cost and schedule metrics	Monthly		
Project Team/Contractor	o Design/construction report	Weekly	Progress Meeting with Minutes and Action Items	OR Project Manager
	o Progress report			

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Stakeholder	Information	Frequency	Methodology	Responsible
Niagara Plant Group	<ul style="list-style-type: none"> <li>Technical documentation</li> <li>Stakeholder issues</li> </ul>	Bi-Weekly	Meeting	OR Project Manager
General Public	<ul style="list-style-type: none"> <li>Project status / Press releases</li> </ul>	As appropriate	(opg.com with section on NTP)	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 by 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

Filed: 2010-11-10

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Attachment 1 (NON-CONFIDENTIAL)

## **19 Records Management**

During execution of the Project, most project records will be kept at the Project Records Centre at the OR Site Office (archives at Hatch 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 permanent records will be transmitted to the NPG Records Centre.

Documents and records are organized in accordance with the OPG System Classification Index (SCI) system.

### **19.1 Data Room**

A Data Room was assembled and open to prequalified proponents intending to submit a proposal for the Facility Project. In compiling the material for the Data Room, OPG and its Representatives elected to make available, to proponents, all information, of which they are aware, that is potentially relevant to the Project. 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 Rock Core Samples**

The core samples are currently located at the OPG Niagara Transformer Station, 1900 Murray Street (at Main Street) in Niagara Falls, and are available for viewing by the OR/ Contractor. It is planned to move the core samples to 2600 Stanley Ave in 2010. Visits to inspect the core samples can be arranged by contacting the NPG SPOC.

### **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. The author or original recipient of external documents is responsible for assigning a proper document number and providing the original or a file copy to the Project Records Center.

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 NPG 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 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	Fisheries and Oceans Canada (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	✓		

## SCI Listing for Project Document Management

SCI #	Description	Correspondence	Reports	Drawings
00600	Procurement	✓		
01900	Quality Engineering	✓		
02700	Hydraulic Engineering	✓	✓	✓
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***

OPG Hydro has an electronic document management system. Project documents (e.g., drawings, manuals, reports, correspondence, etc) should be formulated in electronic format compatible with the electronic document management system. OPG Hydro 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 will be utilized for development of the Project schedule.

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Attachment 1 (NON-CONFIDENTIAL)

## **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 (GFA, 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. The Project Sponsor is responsible for reviewing and accepting The Project Closeout report 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 ADBA for the Niagara Tunnel Facility
- 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 NPG
- prepare Deficiencies report, including schedule for rectification
- prepare Project Completion Report
- prepare Project Management Controls Report
- prepare Certificate of Acceptance
- complete OPG Reports 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 Rectifying Deficiencies (includes Scope Verification & Deficiency Report)***

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
- Engineering Manager concerning design documentation issues
- Environmental/Third Party Manager for EA and third party issues
- OR Project 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 during the Close-out Phase, 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.

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.

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 OPG 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.

### ***20.7 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 and amended 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 party agencies and regulators.

### ***20.8 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 NPG.

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, particularly to facilitate familiarization, training, operation and maintenance of the new diversion tunnel and auxiliaries.

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 and all amendments to same
- all original agreements with and certificates of approval from all third party agencies and all amendments to same
- final document submittals
- as-built drawings from the Contractors
- design calculations including those for any changes to the initial contract design
- signed-off completed deficiency lists after deficiencies are rectified
- affidavits from the designers
- 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.

## ***20.9 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 PEP
- 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 may 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 (NPG) satisfied with the facility as delivered?

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

## ***20.10 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 NPG Manager and the Project Sponsor.

## ***20.11 Asset In-Service Report***

Upon successful completion of commissioning, the tunnel will be ready for full commercial operation by the NPG. At this stage the OPG Project Director and the NPG Manager will complete and file the REIS form. The interest charged to the Project will then stop as the facility begins commercial service.

## **Appendix A – Project Charter**



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Attachment 1 (NON-CONFIDENTIAL)

## 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 [REDACTED] 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.

### 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:

- 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.
- Directly request assistance from OPG functional departments, as necessary.
- Retain contractors and consultants, as required.
- 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	PM
2 Purpose of Project and Objectives	PM
3 Project Scope	PM
4 Project Authorization	PD
5 Health and Safety Management	SA
6 External Stakeholders	EM
7 Approvals and Third Party Requirements	EM
8 Execution and Delivery Strategy	PM
9 Organization, Roles and Responsibilities	PM
10 Authority Levels	PD
11 Schedule and Milestones	PCM
12 Project Cost Estimate	PCM
13 Project Controls and Reporting	PCM
14 Risk Assessment and Risk Management	RMA
15 Engineering Management Plan	DM
16 Construction, Installation and Commissioning Management Plan	CM
17 Environmental Plan	EM
18 Communications Plans	PAD
19 Records Management	SOM
20 Project Closeout	PCM

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## **Appendix C – Niagara Plant Group Memorandum of Understanding**



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Attachment 1 (NON-CONFIDENTIAL)

## **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 [REDACTED] per day for OPG caused delays.
- The NPG energy revenues are in the order of [REDACTED] 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.

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### **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 to complete 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.

## **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.

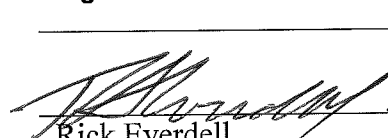
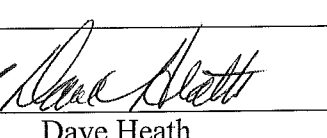
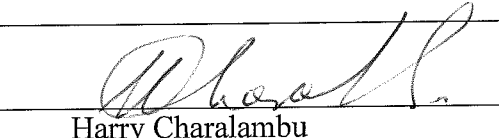
NTP will follow the intent of the current NPG equipment turnover approved instruction.

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



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Attachment 1 (NON-CONFIDENTIAL)

## Appendix D – Acronyms and Definitions

ADBA	Amended Design Build Agreement
BAR	Builders All Risk Insurance
BSC	Business Case Summary
BTX/BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CBS	Cost Breakdown Structure
CCB	Change Control Board
CI	Change Initiation
CIA	Community Impact Agreement
CPI	Cost Performance Index
CPR	Cardiopulmonary Resuscitation
DFO	Fisheries and Oceans Canada (Department of Fisheries and Oceans)
E&O	Errors and Omissions
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
GR	Geotechnical Report
HST	Harmonized Sales Tax
IESO	Independent Electricity System Operator
IJC	International Joint Commission
INBC	International Niagara Board of Control
INCW	International Niagara Control Works
JSA	Job Safety Analysis
LUEC	Levelized Unit Energy Cost
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MOL	Ministry of Labour
MOU	Memorandum of Understanding between Project and NPG
NCN	Non-Conformance Notice
NPC	Niagara Parks Commission
NPCA	Niagara Peninsula Conservation Authority
NPG	Niagara Plant Group
NRHD	Niagara River Hydroelectric Development
OAR	Organization Authority Register
OCIP	Owners Controlled Insurance Policy
OHSA	Occupational Health and Safety Act
OPG	Ontario Power Generation

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OPGS	Ontario Power Generating Station
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 OHSA) for a limited period
PCD	Project Change Directive
PCN	Project Change Notice
PEP	Project Execution Plan
PGS	Pump Generating Station
PIR	Post Implementation Review
Project	Niagara Tunnel Project
REIS	Report of Equipment In-Service
RFE	Request for Expenditure
RMON	Regional Municipality of Niagara
RMP	Risk Management Plan
RQE	Release Quality Estimate
SAB	Sir Adam Beck
SC	Steering Committee
SCI	System Classification Index
SPI	Schedule Performance Indices
SPOC	Single Point of Contact
T&C	Terms and Conditions
TBM	Tunnel Boring Machine
TPGS	Toronto Power Generating Station
WBS	Work Breakdown Structure
WSIB	Workplace Safety & Insurance Board
WUL	Wrap-Up Liability Insurance

## Appendix E – Responsibility Matrix

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Attachment 1 (NON-CONFIDENTIAL)

# Niagara Tunnel Project

## Responsibility Matrix

### LEGEND

<b>PS</b>	Project Sponsor	<b>REA</b>	Real Estate Advisor
<b>PD</b>	Project Director	<b>SCD</b>	Supply Chain Director
<b>PSM</b>	Project Support Manager	<b>LAW</b>	Lawyer
<b>PGM</b>	Plant Group Manager	<b>CFD</b>	Corporate Finance Director
<b>PGS</b>	Plant Group SPOC	<b>PM</b>	Project Manager (OR)
<b>PAA</b>	Public Affairs Advisor	<b>DM</b>	Engineering Manager (OR)
<b>RMA</b>	Risk Management Advisor	<b>CM</b>	Construction Manager (OR)
<b>HFD</b>	Hydro Finance Director	<b>PCM</b>	Project Controls Manager (OR)
<b>HFA</b>	Hydro Finance Advisor	<b>EM</b>	Environment & Third Party Manager (OR)
<b>PAD</b>	Public Affairs Director	<b>SOM</b>	Site Office Manager (OR)
		<b>STR</b>	STRABAG (DB Contractor)

<b>R</b> = Responsible	<b>A</b> = Must Approve (sign-off)
<b>R1</b> = Preliminary Documentation	<b>C</b> = Must be Consulted (includes support, review and other input)
<b>R2</b> = Final Documentation	<b>I</b> = Must be Informed (for information only, no action needed)

PEP	Element / Subject / Function / Activity	OPG															OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes		
	Project Management																									
	Provide Project Direction & Oversight	R	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Extended Project Team Members		
	Prepare Project Charter	A	R	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Extended Project Team Members		
	Prepare & Issue Project Execution Plan (Original)	A	A	C	C	C	C	C	C	C	C	C	C	C	C	R	C	C	C	C	C		I	Extended Project Team Members		
	Prepare & Issue Project Execution Plan (Revisions)	A	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		I	Extended Project Team Members		
	Prepare / Maintain Memo of Understanding (MOU) with Niagara PG	I	A	I	A	C	I	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	I	Extended Project Team Members		
	Prepare / Maintain Protocols for MOU with Niagara PG	I	C	I	I	C	C								R	I	I	I	I	I	I	I	I	NPG & INCW Operators		
	Prepare Business Case Summary (BCS), including Superseding BCS	A	R	C			C		C	C					C	C			C							
	Obtain OPG Board Approval	R	I						I					I		I										
	Prepare / Execute Budget Transfers	A	R						A	C						I			I				A	Per Donn Hanbidge Memo		
	Health & Safety Management																									
	Communicate OPG Safety Expectations to OR	I	R																				C	Lonny Clarke		
	Communicate OPG Safety Expectations to Contractor		I													R							C	Lonny Clarke		
	Prepare / Maintain Site Specific H&S Plan, including INCW Part Project		I													I						R				
	Execute Site Specific H&S Plan, including INCW Part Project																					R				
	Review & Audit Site Specific H&S Plan, including INCW Part Project		I													R										
	Prepare INCW Part Project H&S Management Plan (OR #SM0001)		I		I	I										R		C								
	Manage Site Safety as "Constructor" except INCW Part Project																					R				
	Manage Site Safety as "Constructor" during INCW Part Project															R		C								
	Report Owner-Only Contractor Safety Incidents to MOL		I													I						R				
	Report INCW Part Project Safety Incidents to MOL		C													R							C	Lonny Clarke		
	Report Safety Incidents, MOL Visits, MOL Orders, etc to OR															I						R				
	Report Safety Incidents, MOL Visits, MOL Orders, etc to OPG		I													R										
	Report Safety Incidents to OPG Management per OPG-SFTY-STD-005	I	R										I										I	Lonny Clarke & Marylou Sinclair		
	Investigate Owner Only Safety Incidents & Issue Incident Reports		I													I						R				

## Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR					DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes
	Investigate INCW Part Project Safety Incidents & Issue Incident Reports		A													R		C				C		Per OPG-SFTY-STD-005
	Review Contractor Safety Reports		I													R	C	C						
	Prepare & Report Project H&S Incident Statistics to OPG		I													R	C	C						
	<b>Environmental Management</b>																							
	Communicate OPG Environmental Expectations to OR	I	R																				C	Susan Rapin
	Communicate OPG Environmental Expectations to Contractor		I													R								
	Prepare / Maintain Site Specific Environmental Management Plan		I													I				I		R		
	Execute Site Specific Environmental Management Plan & Self Assessment															I				I		R		
	Review & Audit Site Specific Environmental Management Plan Compliance		I													R				I				
	Report Environmental Infractions to MOE / Regulators		I													I				I		R		
	Report Environmental Incidents to OR															I				I		R		
	Report Environmental Incidents to OPG		I													R							I	Lauren Sasaki / Chirasthi Mendis
	Report Environmental Incidents to OPG Management	I	R																				I	John Murphy & Susan Rapin
	Investigate Environmental Incidents & Issue Incident Reports		I													I						R		
	Review Contractor Environmental Compliance / Incident Reports		I													R				I				
	Prepare & Report Project Environmental Incident Statistics to OPG		I													R				C			I	Lauren Sasaki / Chirasthi Mendis
	Submit Annual Compliance Monitoring Reports to MOE / Regulators		A													I				R		C		
	Develop & Maintain the Permits / Approvals Database		I													I				R				
	Complete Monitoring Requirements for Fisheries Compensation Plan		I													I				R				
	Monitor Construction Activities for Environmental Compliance		I															i		i		R		
	<b>Permits &amp; Approvals (R1 = Preliminary Documents &amp; R2 = Final Documents)</b>																							
	Prepare Submissions to Address EA Conditions		A													C				R		C		
	Submit Documentation to Address EA Conditions		R													C				I		I		
	Prepare Compliance with EA Documentation (Condition 1.1)		C													C				R		I		
	Submit Condition 1.1 Documentation		R													I				I		I		
	Prepare Delay to Construction Documentation (Condition 1.2)		C													C				R		I		
	Submit Condition 1.2 Documentation		R													I				I		I		
	Prepare Expiration of Approval Documentation (Condition 1.3)		C													C				R		I		
	Submit Condition 1.3 Documentation		R													I				I		I		
	Prepare Implementation Plan for Phased Construction (Condition 1.4)		C													C				R		I		
	Submit Condition 1.4 Documentation		R													I				I		I		
	Prepare Compliance Monitoring Program (Condition 1.6)		C													C				R		I		
	Submit Condition 1.6 Documentation		R													I				I		I		
	Prepare Implementation Plan for Undertaking (Condition 1.8)		C													C				R		I		
	Submit Condition 1.8 Documentation		R													I				I		I		
	Prepare Procedure for Amending EA (Condition 1.9)		C													C				R		I	C	Chirasthi Mendis

## Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Submit Condition 1.9 Documentation		R												I				I		I				
	Prepare Notification Procedure for Minor Amendments (Condition 1.10)		C												C				R		I	C		Chirasthi Mendis	
	Submit Condition 1.10 Documentation		R												I				I		I				
	Facilitate Project Information Flow under the CIA (Condition 1.11)		C				C								C				R		I				
	Provide Documents for Public Record (Condition 1.12)		C												C				R		I				
	Prepare Plan for Re-Use of Excavated Materials Committee (Condition 2.1)		C												C				R		I				
	Submit Condition 2.1 Documentation		R												I				I		I				
	Prepare Re-Use of Excavated Materials Report (Condition 2.2)		C												I				R		I				
	Submit Condition 2.2 Documentation		R												I				I		I				
	Prepare plan for disposal of excavated materials on OPG lands (Condition 2.3.1)		C												C				R1		R2				
	Submit Condition 2.3.1 Documentation		R												I				I		I				
	Prepare Disposal Monitoring and Contingency Plan for BTX (Condition 3.1)		C												C				R1		R2				
	Submit Condition 3.1 Documentation		R												I				I		I				
	Prepare Hydrogeology - Groundwater Mapping Documentation (Condition 4.1)		C												C				R1		R2	C		Genivar (Jagger Hims)	
	Submit Condition 4.1 Documentation		R												I				I		I				
	Prepare Hydrogeology - Groundwater Monitoring Plan (Condition 4.2)		C												C				R1		R2	C		Genivar (Jagger Hims)	
	Submit Condition 4.2 Documentation		R												I				I		I				
	Prepare Construction Effects of Tunnel & Shafts Report (Condition 5.1)		C												C				R1		R2				
	Submit Condition 5.1 Documentation		R												I				I		I				
	Document Effects of Flow Changes on Components (Condition 7.1)		C												C	C			R		I				
	Submit Condition 7.1 Documentation		R												I				I		I				
	Document Effectiveness of Mitigation to Address TSS loadings (Condition 7.2a)		I												C				R1		R2				
	Submit Condition 7.2a Documentation		R												I				I		I				
	Prepare Erosion and Sedimentation Control Plans (Condition 7.2c)		I												C				R1		R2				
	Submit Condition 7.2c Documentation		R												I				I		I				
	Prepare an assessment of the effects of reduced flows in the lower Welland River to fish habitat and to adjacent properties/users (Condition 7.4)		C												C	C			R		I				
	Submit Condition 7.4 Documentation		R												I				I		I				
	Demonstrate that hydraulic gradient line in Welland River will remain within present range and not reduce sediment carrying capacity (Condirion 7.5)		C												C	C			R		I				
	Submit Condition 7.5 Documentation		R												I				I		I				
	Follow Ontario Hydro noise protocol (Condition 8.1)																				R				
	Complete a reassessment of Noise assessment (Condition 8.2)		I												C	C			R		I				
	Submit Condition 8.2 Documentation		R												I				I		I				
	Prepare Citizen Complaint Procedure Documentation (Condition 9.2)		I				C								C				R		C				
	Submit Condition 9.2 Documentation		R				I								I				I		I				
	Prepare erosion and storm water runoff plans (Condition 9.4)		I												C	C			R1		R2				
	Submit Condition 9.4 Documentation		R												I				I		I				
	Carry out Community Impact Agreement (Condition 9.5)		C				C								C				R		C				



## Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Complete documentation for aquatic habitat survey and habitat compensation if applicable (Condition 10.1)		A												C					R		I			
	Submit Condition 10.1 Documentation		R												I					I		I			
	Verify that intake design limits fish entrainment (Condition 10.2)		C												C	C				R		I			
	Submit Condition 10.2 Documentation		R												I					I		I			
	Obtain Other Permits, Approvals or Third Party Requirements		I												I					I		R			
	Obtain International Niagara Diversion Treaty Approval from IJC		R												I					C		I	C	Joan Frain & Dept of External Affairs	
	Obtain Navigable Waters Protection Act Approval		A												I					R		C	A	Ministry of Natural Resources	
	Obtain Transportation of Dangerous Goods Act from Transport Canada		I												I					I		R	A	Transport Canada	
	Obtain Fisheries Act Authorization (s 32) for Destruction of Fish		A												I					R		C	A	Department of Fisheries & Oceans	
	Obtain Fisheries Act Authorization (s 35) for Harmful Alteration of Habitat		A												I					R		C	A	Department of Fisheries & Oceans	
	Obtain Work Permits under Lakes & Rivers Improvement Act		I												I					C		R	A	Ministry of Natural Resources	
	Obtain Permits to Take Water		I												I					I		R	A	Ministry of the Environment	
	Obtain Certificates of Approval (Air)		I												I					I		R	A	Ministry of the Environment	
	Obtain Certificates of Approval (Industrial Sewage Works)		I												I					C		R	A	Ministry of the Environment	
	Obtain Waste Generator Registration		I												I					I		R	A	Ministry of the Environment	
	Obtain Dust Suppressant License		I												I					I		R	A	Ministry of the Environment	
	Obtain Approvals & Agreements per Community Impact Agreement (CIA)		A		I		I								I					R		C		RMON, NF & NOTL	
	Obtain Approval for Transportation Impact Management Plan from RMON & NF		A												C					R		C		RMON & NF	
	Obtain Approval for Tourism Impact Management Plan from NF & NOTL		A												C					R		C		NF & NOTL	
	Coordinate with Emergency Services from NF, RMON & NOTL		A												C					R		C		NF, RMON & NOTL	
	Obtain required Municipal Services from NF & RMON		A												C					R		C		NF & RMON	
	Obtain Required Municipal Approvals (Building Permits, Entrance Permits, etc)		I												I					C		R	A	RMON & NF	
	Obtain Approval for Restricted Boat Access at NCW		I												I					I		R	A	Transport Canada	
	<b>Project Controls &amp; Reporting</b>																								
	Prepare Release Quality Estimates (RQE), including Basis of Estimate		A							C					C	C			R						
	Prepare & Maintain Work Breakdown Structure (WBS)		A							C					C	C			R						
	Prepare & Maintain Cost Breakdown Structure (CBS)		A							C					C	C			R						
	Prepare & Update Milestone Schedule (Level 1)		I												R	C	C	C							
	Prepare & Update Summary Schedule (Level 2)		I												R	C	C	C							
	Prepare & Update Production Schedules (Baseline & Progress)		I												I		I	I			R				
	Review DB Contractor's Books & Records (Weekly)																	I				R		DJB	
	Review / Validate DB Contractor Monthly Invoice		I							C					C			R							
	Verify DB Contractor's Monthly Financial Statements		I							I					I			C				R		DJB	
	Verify Eligibility of Allowed Costs / Identify Disallowed Costs		I												C			R				C		DJB	
	Reconcile the Contractor's Monthly Invoices (Estimated vs. Actual)									I					I			C				R		DJB	
	Verify DB Contractor Invoices for Payment		I							I					R			C							
	Approve DB Contractor Invoices for Payment		R							C															

# Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Prepare DB Contractor Requests for Expenditure (RFE) > \$100k															I						R			
	Review DB Contractor's RFEs vs Table of Investments		I													R	C	C	C						
	Prepare Recommendations for DB Contractor RFEs		A													R			C						
	Review Contractor's Claims & Recommend Resolution Options		I										C			R	C	C	C						
	Prepare & Update a Claims Log		I						I							I			R						
	Prepare Projection of Cash Requirements		I							C						I			R						
	Prepare Cost Forecasts to Completion	I	I							I						I			R						
	Calculate CPI & SPI for Key Activities	I	I													I			R						
	Analyze Cost & Schedule Results		I													C			R						
	Record Weekly Progress on Time / Way Diagram															I			I			R			
	Prepare & Submit Project Change Notices (PCN)		I						I				I	I		I			I			R			
	Review Project Change Notices (PCN) & Recommend Response		I										I	I		R	C	C	C						
	Prepare & Issue Project Change Directives (PCD)		A						I				I	C		R			C						
	Prepare & Issue PCD (not Deemed Amendment)		A						I				C	C		R			C						
	Prepare & Issue PCD (Deemed Amendments)	A	A						I				C	C		R			C			A			
	Identify & Submit Potential Insurance Claims		I										I			R							C	John Floras	
	Organize & Chair Change Control Board (CCB)		I						I					C		R			I						
	Prepare & Issue CCB Recommendations	A	I						I					I		R			C						
	Prepare Contractor Notice of Intent to Commence Informal Resolution	I	I						I				I	I		I			I			R			
	Prepare OPG Notice of Intent to Commence Informal Resolution	I	C						I				I	C		R			C						
	Prepare Notice of Decision by Steering Committee	I	C						I				I	C		R			C			C	A	John Murphy & Oskar Roittner	
	Reporting																								
	Prepare & Issue Monthly Manhours for Work on Project Site		I													I			I			R			
	Prepare & Issue Weekly Construction Progress Reports	I	I	I	I	I		I	I	I	I	I	I	I	I	R	I	C	C	C	I		I	Extended Project Team	
	Maintain OPG Action Tracking System & Issue Weekly Updates	I	I	I	I	I	I	I	I	I	I	I	I	I	I	C	I	I	I	I	R		I	Extended Project Team	
	Prepare & Issue Monthly Project Status Report		I													R	C	C	C	C	I				
	Distribute Monthly Project Status Report Executive Summary	I	R	I	I	I	I	I	I	I	I	I	I	I									I	Extended Project Team	
	Prepare OPG Board / ROC / EMT Updates	A	R						I					I									A	John Murphy	
	Prepare Reports for OPG Shareholder (as required)	A	R																				A	John Murphy & Neal Kelly	
	Risk Management																								
	Conduct & Issue Initial Qualitative Risk Assessment	C	C	C	C	C	I	R	C	C	C	C	C	C	C	C	C	C	C	C	I		C	Extended Project Team	
	Conduct & Issue Initial Quantitative Risk Assessment	A	C	C	I	C	I	R	C	C	C	C	C	C	C	C	C	C	C	C	I		C	Extended Project Team	
	Prepare & Maintain OPG Key Risk Plan	C	C	C		C		R	C	C	C	C		C		C	C	C	C	C	I				
	Monitor OPG Risks		R					C								C	C	C	C	C			C	All Risk Champions / SME	
	Prepare & Maintain Construction Risk Register		I													R	C	C	C	C	C	C			
	Monitor Construction Risks		I													I						R			

## Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG															OR					DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Acquire Owner Controlled Insurance Program	I	A										C	C		C			C			C	R	John Floras & Marsh	
	Procurement Management																								
	Develop Project Procurement Strategy	C	C										R	C		C			C				C	Phil Symmonds (Torys)	
	Prepare Design / Build Request for Proposal (RFP) Documents	C	A	C	C	C		C					A	C		R	C	C	C	C			C	Phil Symmonds (Torys)	
	Issue Design / Build Request for Proposal (RFP) Documents	I	A										R	I		I							I	Phil Symmonds (Torys)	
	Coordinate Design / Build Proposal Process		I										A	I		R							I	Phil Symmonds (Torys)	
	Evaluate Design / Build Proposals	I	A	C		C		C					C	C	C	R	C	C	C	C			C	Phil Symmonds (Torys)	
	Negotiate Design / Build Agreement & Amendments	I	A										R			C	C	C	C	C			C	Phil Symmonds (Torys)	
	Draft Design / Build Agreement & Amendments	I	C										A	R		C	C	C	C	C		C	C	Phil Symmonds (Torys)	
	Execute Design / Build Agreement & Amendments	A	R						I				A	I		I			I		I		A	John Murphy / Tom Mitchell	
	Draft Owner's Rep Contract & Amendments		A						I				A	R		C								John Murphy / Tom Mitchell	
	Prepare Proposals for Owner's Rep Contract & Amendments	I	I										I	I		R									
	Execute Owner's Rep Contract & Amendments	A	A	I									R	C									A	John Murphy / Tom Mitchell	
	Prepare RFPs for Other OR Service Contracts		C										C	C		R			C						
	Issue RFPs for Other OR Service Contracts		A										C	C		R			C						
	Receive & Evaluate Proposals for Other OR Service Contracts		A										C	C		R			C						
	Prepare RFPs for Other OPG Service Contracts		R										C	C									C	OPG Contract Administrator	
	Issue RFPs for Other OPG Service Contracts		A										R	C									C	OPG Contract Administrator	
	Receive & Evaluate Proposals for Other OPG Service Contracts		A										R	C									C	OPG Contract Administrator	
	Prepare OPG Purchase Requisitions (in SAP)		A							R			I												
	Prepare & Issue OPG Purchase Orders & Amendments		I										A			I			I				R	Rose Marie Lyon (Buyer)	
	Review / Verify Vendor Invoices for Other OR Services		I							I						R									
	Review / Verify Vendor Invoices for OPG Expert Services		A							I			I	R											
	Review / Verify Vendor Invoices for OPG Legal Services		A							I			I	R											
	Review / Verify Vendor Invoices for OPG Survey Services		A							I		R	I												
	Review / Verify Vendor Invoices for OR Services		A	R									I												
	Acquire Property Rights for Project		I	I							R					I	C						C	Brent Larocque (Surveyor)	
	Engineering Management																								
	Prepare Tunnel Facility Design Basis		I													I	I	I				R			
	Prepare Tunnel Facility Design Drawings		I													I	I	I				R			
	Review Contractor's Design Submittals		I													C	R	C					C	NPG & Hydro Eng. for Gates Design	
	Conduct / Arrange for Required Studies to Support Project		I			I										R	C								
	Review Geotech / Profile Restoration Design		I			I										C	R	C					C	Vivek Bhardwal (Hydro Eng)	
	Review Intake & Outlet Gate Designs		I			C										C	R	C					C	Enos Candido (Hydro Eng)	
	Review & Disposition Contractor Non-Conformance Items		A													R	C	C	C						
	Review & Disposition Contractor Non-Compliance Items		A													R	C	C	C						

# Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Construction Management																								
	Prepare Method Statements for Construction															I		I				R			
	Review Method Statements for Construction		I													R		C							
	Construct Tunnel Intake & Associated Structures & Facilities															I						R			
	Monitor Construction of Tunnel Intake & Associated Structures & Facilities		I													C		R							
	Construct Diversion Tunnel & Associated Facilities															I						R			
	Monitor Construction of Diversion Tunnel & Associated Facilities		I													C	C	R							
	Construct Outlet Structure & Associated Structures															I						R			
	Monitor Construction of Outlet Structure & Associated Facilities		I													C	C	R							
	Establish Project Survey Control Network		I													C	C	R					C	Monteith & Sutherland	
	Execute Periodic Survey Audits of the Work		I													C	C	R					C	Monteith & Sutherland	
	Maintain Photo Record of Work Progress		I													R	C	C		C					
	Review Contractor's Submittals for Constructability		I													C	C	R							
	Prepare & Maintain a "Punch List" of Deficient / Incomplete Work		I													C	C	R		C					
	Address Contractor's Non-compliance with ADBA	I	C											C		R	C	C	C	C					
	Quality Management																								
	Prepare Quality Assurance (QA) Plan		I													I						R			
	Prepare Quality Control (QC) Procedures		I													I						R			
	Execute QA / QC Program		I													I						R			
	Review, Monitor & Audit QA / QC Program		I													R	C	C							
	Review / Monitor Contractor's Compliance with QA Program		I													C	C	R							
	Monitor Factory Testing		I													R	C	C							
	Prepare & Maintain Construction Deficiency List & Metrics		I													C	C	R	C						
	Communications Management																								
	Prepare & Deliver Project Team Communications		R													C									
	Prepare Internal (OPG) Communications Plan		A				I				R														
	Prepare & Deliver Internal (OPG) Communications	A	C		I		I				R														
	Develop & Maintain / Update OPG Intranet Website		C				I				R														
	Prepare External (Public) Communications Plan		A				I				R					I				I					
	Prepare & Deliver External (Public) Communications	C	C		I		I				R														
	Provide Local Public Communications Support						R																		
	Develop & Maintain / Update OPG Internet Website, Videos, etc		A				I				R											A		Chuck Pautler	
	Report Calling of Emergency Services to Site		I													I						R	I	OPG Media Desk	
	Address Media Inquires	I	C				C				C					I							R	OPG Media Desk	
	Address Public Complaints (Citizens, Hotline, etc)		I		I		R									I				C		C			

# Niagara Tunnel Project

## Responsibility Matrix

PEP	Element / Subject / Function / Activity	OPG														OR						DB		Other	
		PS	PD	PSM	PGM	PGS	PAA	RMA	HFD	HFA	PAD	REA	SCD	LAW	CFD	PM	DM	CM	PCM	EM	SOM	STR	Role	Name / Notes	
	Address Project Tour Requests		R				I				I					C						C			
	Address Project Presentation Requests		R				I				I														
	Records Management																								
	Organize Project Records System		I													I					R				
	Maintain OPG Official Records (Correspondence, Drawings, Reports)																				R				
	Assemble Data Room Documents for RFP		C			C							C	C		C					R				
	File Project Documents															I					R				
	File Originals of Legal Agreements		I										I	R		I					I				
	Testing & Commissioning																								
	Conduct Tunnel Flow Test		I			I										C	C					R	C	Alden Labs	
	Monitor Post Installation Testing		I	I												R	C	C							
	Prepare & Issue Operation & Maintenance Manuals		I	I	I	I										I						R			
	Document Operating Characteristics & SCADA Integration		C			C										R	C								
	Prepare Commissioning & Turnover Plan		C		I	C										R	C	C		C					
	Train NPG Staff for Operation & Maintenance of Gates & Auxiliaries		I	I	I	C										C	C	C				R			
	Project Closeout																								
	Prepare Project Closeout Plan		A													A			R						
	Prepare Scope Verification Report		A			C										C	C	C	R	C					
	Prepare Schedule for Rectifying Deficiencies		I													A		C	R	C					
	Prepare Deficiency Report (remaining after Final Completion)		A													R	C								
	Prepare & Submit As-Built Drawings & Design Descriptions		I													I	I	I	I			R			
	Verify As-Built Drawings from the Contractor		I														R								
	Provide Design Calculations for any Changes to Initial Contract Design		I														C					R			
	Prepare a List with Descriptions of all Approved Contract Changes		I														C		R						
	Submit Warranties		I			I							I			I			I			R			
	Verify Warranties for Construction Contracts		I			I							I			R									
	Verify Approvals & Sign-offs from Third Party Agencies & Regulators		I											I		I				R		C			
	Review Lessons Learned	I	C	C	C	C	C	C	C	C	C	C	C	C	C	R	C	C	C	C			C	Extended Project Team Members	
	Prepare Project Completion Report	A	R								C					C			C						
	Prepare Project Management Controls Report		I													I			R						
	Prepare Certificate of Acceptance	A	R		A				C	C			C	C		C		C	C						
	Prepare OPG Reports of Equipment in Service (REIS)		R		A	C			C	C															
	Transfer Project Records to OPG / NPG Records Centre		I			I										R					C				
	Conduct Post Implementation Review (P R)	A	R			C			C	C						C			C						
	Prepare Final Review of Variance	A	R						C	C						C			C						

# Niagara Tunnel Project

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	Close Project in SAP	I	I						I	R														
	Human Resources Management																							
	Review / Approve Key OR Staff	I	R						C				C			I								
	Review / Approve Key DB Contractor Staff	I	A						C				C			R								
	Engage OPG Support Staff		R													I								
	Execute CPAA Trades Work Assignment		R			I										I								
	Execute EPSCA Mark-up		I										I			I						R		
	Engage EPSCA Trades																					R		
	Negotiate PWU PSA & Amendments	I	R																				C	Hydro HR
	Negotiate Society PSA & Amendments	I	R																				C	Hydro HR

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Attachment 1 (NON-CONFIDENTIAL)

## **Appendix F – Target Schedule**

As from ADBA

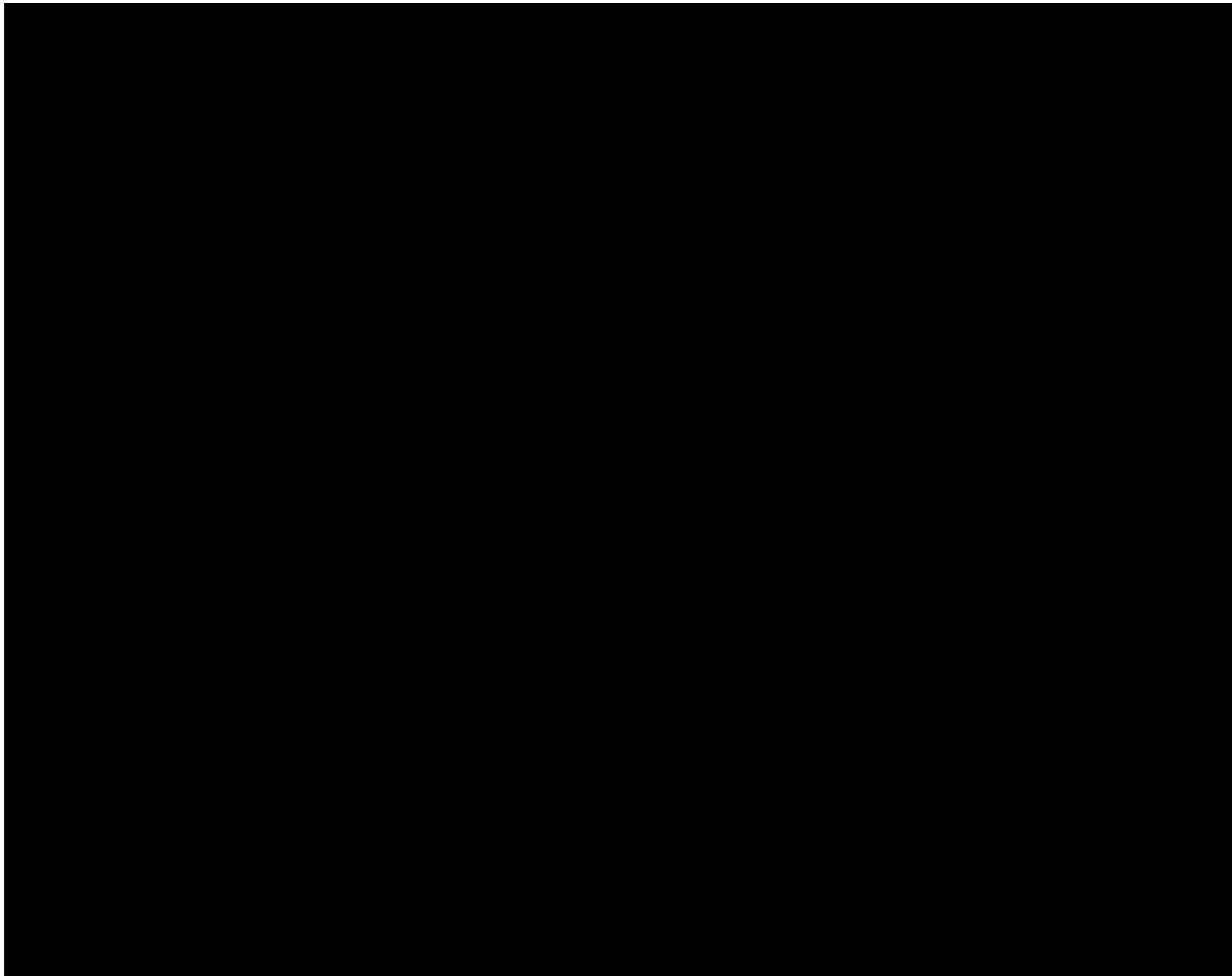


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