GENIVAR

Technical Memo

Project Risk Management

Front Road Watermain and Portsmouth Forcemain Project

Kingston, Ontario

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1.0 Introduction

In any project or undertaking, there are a number of factors which can negatively or positively affect the outcome. The process of identifying, quantifying and responding to these risk factors, is called Risk Management. In simple terms it is a systematic approach to measure and manage uncertainty, in an objective and quantitative manner.

The process is one whereby you establish a list of incidents which could impact the project; analyze each of those incidents to estimate the impact to the project should they occur, and formulate a response strategy to manage the significant critical incidents. While often only incidents with a negative impact are considered, positive events which could provide opportunities should also be reviewed.

This document, which has been prepared for the Utilities Kingston, specifically to address risks associated with watermain and forcemain routing particular to the Front Road Trunk Watermain Connection and Portsmouth Forcemain Project, is not a comprehensive Risk Assessment insofar as it does not attempt to quantify impact or probability or occurrence. However, it does identify a quantity of potential risks which exist in a project of this nature, and identifies some specific key risks of concern. By identifying and understanding the risks, controls can be established to ensure that if they can not be eliminated, they are at least managed so that any negative impact is as low as is reasonably practical, and can be budgeted for.

2.0 Goal

This goal of Project Risk Management is to identify project risks in order to develop strategies to mitigate the undesirable impact of negative incidents while maximizing the benefits of positive ones and assist with the selection of preferred routing of the forcemain and watermain.

3.0 Procedure

A Project Risk Management program generally consists of three stages of processes, as outlined below.

3.1 PHASE I – RISK IDENTIFICATION

In this phase, a list of Risk Events which can impact the objectives of the project is assembled along with the associated consequences. Typically, a ‘what-if’ approach is taken to identify potential Risk Events. This often entails a workshop including all the major stakeholders, but for this assignment a desktop assessment was conducted based on a review of project documentation and experience on many other linear infrastructure projects.

Various types of risks exist, and there are many methods of classification used. Risks are sometimes classified as 'known', 'known-unknowns', and 'unknown-unknowns'. The most common risks and the easiest ones to identify are 'known' risk. They are direct risks whose outcome contains no uncertainty. Death after life is a typical example; 'known-unknown' risks are those identifiable issues which could affect the project if they occur, however there is uncertainty that they will occur. Being sued as a result of an injury on the project is an example. Lastly, there are the 'unknown-unknown' risks that we cannot identify or imagine, but which we know exist, may materialize, and could adversely impact the project.

The other common approach to classification is to assess risks associated with categories such as; Cost, Regulatory, Job Site, Organizational, Schedule, etc. That is the method used in this report as it is more tangible to most readers.

3.2 PHASE II – RISK ASSESSMENT

Once the Risk Events have been identified and the potential consequences of each risk have been defined, then each risk can be quantified. The evaluation process consists of estimating the probability of occurrence of a particular risk event, and the impact of the outcome should it occur. Many methods exist for quantifying probability and impact, but typically a list of criteria is established and a corresponding numerical ranking value is assigned based on the criteria. Once a value, say from 1 to 5, has been assigned for both the probability and severity of a given Risk Incident, then a Risk Rating value is determined by plugging those values into a Risk Rating matrix. In this report, no attempt to formally quantify risks has been made, as that represents a level of complexity and cost beyond the scope of this assignment. However, the Risk Register has been formatted to easily facilitate the addition of that data should it be requested and developed at a later date.

3.3 PHASE III –RISK RESPONSE AND CONTROL

Having identified and assessed all the major risk events, the next step is to develop strategies to reduce the probability and/or impact of the outcomes. Many methods of responding to risk exist. One can simply 'do nothing' and accept the consequences; one can 'reduce' the severity of the outcome by sharing the risk or changing the plan; some risk can be 'contracted' to another party and some can be 'avoided' or prevented altogether by eliminating the cause.

In the construction industry, the potential negative impact of some risk events is often managed by purchasing insurance, and policies are typically obtained to cover equipment, vehicle, the work, property damage, personal injury and design errors. Similarly, bonds can be obtained to protect the Owner from non-payment of subs and material suppliers, etc. Contingency allowances in terms of cost and time are another method of dealing with risk and typically a percentage of the total project cost is budgeted for that purpose. Most importantly, good Project and Construction Management procedures and techniques can be implemented to successfully mitigate most risk.

4.0 Approach

The approach taken in this report was to prepare a table of potential risks which may be different for the various routing options, and provide several risk response techniques to manage them. It is not inferred that every Risk Event noted is a valid and known risk on this particular project, but rather that they may exist. As such, by noting the possibility, it is a simple task for those key stakeholders to verify whether the specific potential Risk Events noted are either not valid, or are valid and provide evidence of the Control Strategies currently in place or intended for implementation.

5.0 Analysis

Table 5.1 is a detailed risk management matrix identifying specific Risk Event by category, the Impact (Jeopardy), and outlines a recommended course of action (Risk Response). Tables 5.2 and 5.3 are preliminary cost analysis of the potential cost.

6.0 Conclusions

Many potential risks exist with the installation of linear infrastructure within a developed area such as this. Some, such as blasting operations, are obvious, and therefore will likely receive considerable attention and analysis in terms of risk and mitigation. However, on projects that involve many parties, include multi-discipline design and construction, and are subject to requirements from many approval parties and stakeholders, it is often the accumulation of several lower profile risks that will have a more profound impact on the project, not some single catastrophic event. That is not to say that there is no need to focus attention on risks with a high probability and high impact, but rather to warn that only focusing on those risks can lead one away from the more common, pervasive, administrative type risks which at the end of the project may account for most of the cost and schedule deviation.

Front Road Watermain and
Portsmouth Forcemain Project
RISK Management

Table 5.1

Risk ID No.	Risk Event	Routing 1 (on land)	Routing 2 (in water)
1	Environmental		
Jeopardy	Contamination of soil can be existing but undiscovered.	The presence of contaminated soil and / or water on site could lead to schedule delays and additional costs for disposal if they are discovered at an inopportune time. If discovered during construction, they could interrupt the contractors operations and result in significant extra delay costs.	Not Applicable
Risk Response		Perform an Environmental Site Assessment if one has not been done previously in the area of the proposed works. Take soil and groundwater samples during geotechnical investigations. Prepare or have Contractors provide an Environmental Contingency Plan if there are concerns regarding potential unknown contamination.	
Actions Required/ Taken		An Environmental Site Assessment is being conducted as part of this project.	
Jeopardy	Disruption of the Ecosystem	The scheduling for the installation of the pipe along King/Front Rd and under the Little Cataraqui Creek will need to occur when the potential of impacting the natural life is at the lowest potential.	The scheduling for the installation of submerged pipe within Portsmouth Olympic Harbour and Lake Ontario will need to occur when the potential of impacting the aquatic life is at the lowest potential.
Risk Response		Perform an Preliminary Ecological Assessment if one has not been done previously in the area of the proposed works. Environmental Study Report will document baseline conditions as determined through review of background documents and databases, agency consultation and field work	More indepth study of the aquatic life would be required in order to determine the best time for the installation of the pipe. Additional permits and approvals would be required.
Actions Required/ Taken		A Natural Heritage Assessment is being conducted as part of this project.	If Routing 2 is selected, a detailed schedule will be composed to determine how the selection of this routing will impact the overall schedule of the project.
2	Government & Regulatory		
Jeopardy	Various permits and approvals must be obtained in a large project including Site Plan Approval, Building Permit, Occupancy Permit, Plumbing Permit, Department of Labour Approvals, Consumer and Commercial Affairs Approvals, Fire Marshal Approvals, ESA, etc.	All/most construction within right-of-way of existing infrastructure. Project will require MOE approval for modifications to the pumping station, forcemain (ECA). An amendment to the City of Kingston's Drinking Water Permit through a form 1 will also need to be completed.	All/most construction is not within right-of-way of existing infrastructure. Therefore, legal survey and easments will be required. Routing of in-water pipes will travel through the Portsmouth Marina requiring approvals from Transport Canada, Department of Fisheries and the Ministry of Natural Resources. Project will require MOE approval for modifications to the pumping station, forcemain (ECA). An amendment to the City of Kingston's Drinking Water Permit through a form 1 will also need to be completed.
Risk Response		Perform pre-consultantion with MOE and submit applications in a timely fashion.	Possibility of an impact on schedule will occur due to additional approvals from Transport Canada and DFO. Increased project cost due to in-water survey and easment acquisition.
Actions Required/ Taken		Within scope of existing project.	Initiation of pre-consultation with agencies should occur as soon as possible if this option is selected to mitigate extensions to the schedule.
3	Job Site		
Jeopardy	Impact on Traffic	Construction to occur within right-of-way of road which will impact local traffic. Possible detour will delay local traffic.	Construction will impact the operation of the marina.
Risk Response		Proper public notification and appropriate signage will help mitigate traffic concerns.	Potential loss of profits for the marina and interference with boat owners ability to utilize the marina will need to be addressed.
Actions Required/ Taken		Address through the EA process (public consultation) and project tender.	Initiation of pre-consultation with marina should occur as soon as possible if this option is selected to mitigate extensions to the schedule.
4	Schedule		
Jeopardy	Schedule	Construction of watermains and forcemains within road right-of-ways is a regular occurrence and scheduling of this activity can be predictable.	Construction of submerged pipes pose constraints that are outside of the Contractor's control: weather, accomodating waterway traffic, etc. Approvals required for option could impact the overall schedule of the project. Survey and easment acquisition could also impact on the project schedule.
Risk Response		Addressed in scope of project.	Initiation of pre-consultation with approval agencies will help mitigate the impact on the schedule.
Actions Required/ Taken		Addressed in scope of project.	Decision required to initate risk response.
5	Cost		
Jeopardy	Cost	Construction of watermains and forcemains within road right-of-ways is a regular occurrence and there are signicantly more contractors able to complete the work.	Construction of submerged pipes is a more specialized construction activity and specilizated contractors would be required.
Risk Response		Preparation of clear and concise, yet comprehensive engineering drawings, specifications and quantities that accurately reflect the work to be done	Preparation of clear and concise, yet comprehensive engineering drawings, specifications and quantities that accurately reflect the work to be done
Actions Required/ Taken		Addressed in scope of project.	Decision required to initate risk response.

Front Road Watermain and Portsmouth Forcemain Project
Route 2 (in Water)

Preliminary Estimate
Project No: 131-18048
Date Revised: Wednesday, August 28, 2013

Table 5.2

				Total Engineer's Estimate	
Item No.	**Description**	**Unit Rate**	**Unit**	**Quantity**	**Amount**
1	Removal of Existing Concrete Curb	$40.00	LM	500	$20,000
2	Removal of Existing Asphalt and Concrete	$6.00	SM	2000	$12,000
3	450mm Forcemain by Trenching	$350.00	LM	50	$17,500
4	1050 Wateramin by Trenching	$750.00	LM	500	$375,000
5	450mm Forcemain in Water Work	$1,600.00	LM	3100	$4,960,000
6	450mm Forcemain by HDD	$1,000.00	LM	250	$250,000
7	450mm Valve on Forcemain	$7,500.00	EA	6	$45,000
8	1050mm Watermain in Water Work	$2,000.00	LM	3100	$6,200,000
9	1050mm Watermain by HDD	$1,000.00	LM	250	$250,000
10	1050 Valve on Watemain	$15,000.00	EA	6	$90,000
11	Common Excavation	$10.00	CM	5000	$50,000
12	Granular "B"	$18.00	T	2500	$45,000
13	Granular "A"	$20.00	T	1250	$25,000
14	HotMix Asphalt - HL8	$140.00	T	250	$35,000
15	HotMix Asphalt - HL3	$150.00	T	200	$30,000
16	Concrete Curb & Gutter - All Types	$80.00	LM	500	$40,000
17	Topsoil & Sod	$5.00	SM	10000	$50,000
18	Sediment Control & Environmental Protection	$250,000.00	LS	1	$250,000
19	Traffic Control	$25,000.00	LS	1	$25,000
20	Lump Sum for Other Requirements	4%	LS	1	$600,000.00
21	CONTINGENCY ALLOWANCE	20%	LS	1	$2,700,000
TOTAL:					**$16,069,500**

Note: Cost do not include any pumping station upgrades or transient protection as these cost would be included in both options

Front Road Watermain and Portsmouth Forcemain Project
Route 1 (land)

Preliminary Estimate
Project No: 131-18048
Date Revised: Wednesday, August 28, 2013

Table 5.2

				Total Engineer's Estimate	
Item No.	**Description**	**Unit Rate**	**Unit**	**Quantity**	**Amount**
1	Removal of Existing Concrete Curb	$40.00	LM	2800	$112,000
2	Removal of Existing Asphalt and Concrete	$6.00	SM	12000	$72,000
3	450mm Forcemain by Trenching	$350.00	LM	3000	$1,050,000
4	1050 Wateramin by Trenching	$750.00	LM	3000	$2,250,000
5	450mm Forcemain by HDD	$900.00	LM	250	$225,000
6	450mm Valve on Forcemain	$7,500.00	EA	10	$75,000
7	1050mm Watermain by HDD	$1,300.00	LM	250	$325,000
8	1050 Valve on Watemain	$15,000.00	EA	10	$150,000
9	Common Excavation	$10.00	CM	5000	$50,000
10	Granular "B"	$18.00	T	20000	$360,000
11	Granular "A"	$20.00	T	10000	$200,000
12	HotMix Asphalt - HL8	$140.00	T	2750	$385,000
13	HotMix Asphalt - HL3	$150.00	T	2200	$330,000
14	Concrete Curb & Gutter - All Types	$80.00	LM	2700	$216,000
15	Topsoil & Sod	$5.00	SM	10000	$50,000
16	Sediment Control & Environmental Protection	$100,000.00	LS	1	$100,000
17	Traffic Control	$150,000.00	LS	1	$150,000
18	Lump Sum for Other Requirements	4%	LS	1	$300,000.00
19	CONTINGENCY ALLOWANCE	20%	LS	1	$1,300,000
TOTAL:					**$7,700,000**

Note: Cost do not include any pumping station upgrades or transient protection as these cost would be included in both options