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**ALBERTA MUNICIPAL AFFAIRS
2009 ALBERTA PIPELINES
BASIC COST RATE UPDATE FROM 2008**

AMA CONTRACT #LGS01300

– EPF-0174

September 11, 2009

Project Number: 09E4591

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SYNOPSIS

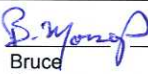
This report documents the *Basic Cost Rate Update from 2008* undertaken as part of the *2009 Alberta Pipelines* project.

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PROJECT - TECHNICAL STUDY REPORT TEMPLATE

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issue for IFA	Rick Kiryluk	Bruce Mossop		Sept 11-09	N/A	



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CONTENTS

1.	EXECUTIVE SUMMARY	4
2.	INTRODUCTION	6
3.	OBJECTIVES & SCOPE	7
3.1	Objective	7
3.2	Scope of the Study	7

Appendices

TABLE 4.1	CARBON STEEL-SUMMER 32 KM
TABLE 4.7	CARBON STEEL-SUMMER 300 KM
TABLE 4.14	NON-STEEL (FIBERGLASS) SUMMARY



**ALBERTA MUNICIPAL AFFAIRS
2009 ALBERTA PIPELINES
BASIC COST RATE UPDATE FROM 2008**

1. EXECUTIVE SUMMARY

Alberta Municipal Affairs (AMA) monitors costs related to the development of conventional pipelines in Alberta on an ongoing basis.

AMA has requested that their existing July, 2008 Cost Data Base be updated to reflect July 1, 2009 costs. The cost information provided should be indicative of a replacement cost, in kind, for the pipelines as generically described in the 2008 database.

The basic pipeline costs rates for 2009 have been developed for this study from current quotations and telephone conversations obtained from material vendors, contractors, land men, surveyors and Consultants.

General reasons why the costs have fluctuated over the last 12 months:

The significant reduction in pipeline construction projects being executed in 2009 has created a competitive market for the contractors. Fuel prices have decreased, and labour shortages have been eliminated. Contractor profit expectations remain consistent with 2008 (18%) and although installation costs have decreased, productivity is expected to increase attributed to the availability of skilled labour.

The governing factors leading to cost variation are as follows:

- Labour rates have gone up 4.4% based on PLCAC for the four main union trades
- Lack of qualified Pipeline Contractors
- The competition for resources both people and equipment are no longer experiencing acute shortages.
- Camp differential went up 5%
- Subsistence allowance went up 1%
- Fuel costs have come down -1%
- Rising Power costs
- Contractor labour Growth -5%
- Sub Contractor Growth -8%

MATERIAL

Obtained current quoted material costs from several vendors for all of the different type of major pipeline materials to update rates from 2008.

Accuracy of the study is as noted below:

Steel Line Pipe, PVC, HDPE, MDPE, Fibre Glass-+/-5%

- Crossing Pipe-+/-5%



**ALBERTA MUNICIPAL AFFAIRS
2009 ALBERTA PIPELINES
BASIC COST RATE UPDATE FROM 2008**

- Steel Pipe Coating-+/-5%
- Valves-+/-10%
- Miscellaneous Materials-+/-7%

INSTALLATION

- Pig Launchers and Receivers +/- 10%
- Crossings-+/-25%
- Pipe Installation Costs are +/- 15%

OUTLOOK FOR JULY 1, 2009 to JULY 1, 2010

Significant reduction in pipeline construction projects being executed late in 2009 and early in 2010 has and will create a very competitive market for contractors.



**ALBERTA MUNICIPAL AFFAIRS
2009 ALBERTA PIPELINES
BASIC COST RATE UPDATE FROM 2008**

2. INTRODUCTION

The following study is required to full fill the need to periodically review and update the costs used in the 'Basic Rates' of the ' Pipeline Assessment Acts of Alberta.

The study not only injects the 2009 installation (labour and equipment) and material costs into the rates but attempts through additions and deletions of various pipeline categories to better reflect the changing construction practices and the emerging technological changes and trends in the pipeline industry.



**ALBERTA MUNICIPAL AFFAIRS
2009 ALBERTA PIPELINES
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3. OBJECTIVES & SCOPE

3.1 Objective

The purpose of this study is to determine the current 2009 costs which will be used to update cost rates for pipeline and distribution systems.

This involves review of the 2003 major study, 2004, 2005, 2006, 2007 and the 2008 updates and updating using current costs for land, engineering, materials, installation and miscellaneous as well as incorporating any changes in construction practices.

WorleyParsons will apply 30 years of experience in the energy industry in Alberta, working extensively with facilities Operators and equipment Vendors, to gather and present this information for application in determining royalties and tax assessments.

3.2 Scope of the Study

- Carbon steel pipe, sweet service, ANSI 150, 300, 400, 600, 900 (**32km** 60.3-1524mm OD)
- Carbon steel pipe, sweet service, ANSI 600, 900 (**300 km** 323.9-1524mm OD)
- Aluminium pipe -N/A
- Plastic, MDPE, (**5 km**, 26.7 mm to 219.1 mm)
- Plastic, HDPE, (**5 km**, 26.7 mm to 406.4 mm)
- PVC, (**5 km**, 750 mm to 1200 mm)
- Plastic, Fibreglass, (**5 km**, 53.3 mm to 914 mm).

Table 4.1 Carbon Steel, ANSI 150 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	6.4	7.1	7.1	7.9	8.7	8.7	9.5	11.1	12.7	14.3	15.9
Schedule/Grade	290	290	290	359	359	359	359	359	359	359	359
Metric O.D (mm)	610	660	711	762	813	864	914	1067	1219	1422	1524
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m											
Subtotal Land Costs (\$/m)											
Preliminary engineering											
Route Reconnaissance											
Environmental											
Archeological											
Geotechnical											
As-Built Drawings											
Commissioning											
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)											
Man-Made Crossings											
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)											
Pipe Costs	2.7%	-22.8%	-22.8%	-23.5%	-26.3%	-26.3%	-26.3%	-26.3%	-23.5%	-17.8%	-16.1%
External Coating-FBE	-27.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	-22.8%	-23.5%	-26.3%	-26.3%	-26.3%	-26.3%	-23.5%	-17.8%	-16.1%	-16.1%	-16.1%
SubTotal Material Costs (\$/m)											
Subtotal Installation Costs (\$/m)	-5.0%	-5.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%
Total Assessable Costs per M											

Table 4.1 Carbon Steel, ANSI 300 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	2.8	2.8	2.8	2.8	3.2	4	4.4	4.8	4.8	4.8	5.6	5.6
Schedule/Grade	290	290	290	290	290	290	290	290	290	290	290	290
Metric O.D (mm)	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457	508	559
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m												
Subtotal Land Costs (\$/m)												
Preliminary engineering												
Route Reconnaissance												
Environmental												
Archeological												
Geotechnical												
As-Built Drawings												
Commissioning												
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)												
Man-Made Crossings												
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)												
Pipe costs	28.4%	30.4%	30.9%	30.8%	30.2%	30.8%	20.2%	2.7%	2.7%	-9.0%	2.7%	2.7%
External Coating-FBE	11.1%	8.8%	12.2%	7.5%	6.8%	4.4%	-6.1%	-16.8%	-18.0%	-22.9%	-22.9%	-22.2%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	30.9%	30.8%	30.2%	30.8%	20.2%	2.7%	2.7%	-9.0%	2.7%	2.7%	2.7%	-22.8%
SubTotal Material Costs (\$/m)												
Subtotal Installation Costs (\$/m)	-20.0%	-20.0%	-20.0%	-20.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Total Assessable Costs per M												
Note: Costs in red are excluded from the assessable cost												

Table 4.1 Carbon Steel, ANSI 300 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	6.4	7.1	7.9	7.9	8.7	8.7	9.5	11.1	12.7	14.3	15.9
Schedule/Grade	290	290	290	359	359	359	359	359	359	359	359
Metric O.D (mm)	610	660	711	762	813	864	914	1067	1219	1422	1524
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m											
Subtotal Land Costs (\$/m)											
Preliminary engineering											
Route Reconnaissance											
Environmental											
Archeological											
Geotechnical											
As-Built Drawings											
Commissioning											
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)											
Man-Made Crossings											
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)											
Pipe costs	2.7%	-22.8%	-22.8%	-23.5%	-26.3%	-26.3%	-26.3%	-26.3%	-23.5%	-17.8%	-16.1%
External Coating-FBE	-27.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	-22.8%	-23.5%	-26.3%	-26.3%	-26.3%	-26.3%	-23.5%	-17.8%	-16.1%	-16.1%	-16.1%
SubTotal Material Costs (\$/m)											
Subtotal Installation Costs (\$/m)	-5.0%	-5.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%
Total Assessable Costs per M											

Table 4.1 Carbon Steel, ANSI 400 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	2.8	2.8	2.8	2.8	3.2	4	4.4	4.8	4.8	4.8	5.6	5.6
Schedule/Grade	290	290	290	290	290	290	290	290	290	290	290	290
Metric O.D (mm)	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457	508	559
Land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land - acquisition/m												
Subtotal Land Costs (\$/m)												
Preliminary engineering												
Route Reconnaissance												
Environmental												
Archeological												
Geotechnical												
As-Built Drawings												
Commissioning												
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)												
Man-Made Crossings												
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)												
Pipe costs	28.4%	30.4%	30.9%	30.8%	30.2%	30.8%	20.2%	2.7%	2.7%	-9.0%	2.7%	2.7%
External Coating-FBE	11.1%	8.8%	12.2%	7.5%	6.8%	4.4%	-6.1%	-16.8%	-18.0%	-22.9%	-22.9%	-22.2%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	30.9%	30.8%	30.2%	30.8%	20.0%	2.7%	2.7%	-9.0%	2.7%	2.7%	1.7%	-23.5%
SubTotal Material Costs (\$/m)												
Subtotal Installation Costs (\$/m)	-20.0%	-20.0%	-20.0%	-20.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Total Assessable Costs per M												
Note: Costs in red are excluded from the assessable cost												

Table 4.1 Carbon Steel, ANSI 400 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	6.4	7.1	7.9	7.9	8.7	8.7	9.5	11.1	12.7	14.3	15.9	
Schedule/Grade	359	359	359	359	359	386	386	386	386	386	414	
Metric O.D (mm)	610	660	711	762	813	864	914	1067	1219	1422	1524	
Land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land - acquisition/m												
Subtotal Land Costs (\$/m)												
Preliminary engineering												
Route Reconnaissance												
Environmental												
Archeological												
Geotechnical												
As-Built Drawings												
Commissioning												
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)												
Man-Made Crossings												
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)												
Pipe costs	1.7%	-23.5%	-23.5%	-23.5%	-26.3%	-27.0%	-27.0%	-27.0%	-24.2%	-18.6%	-19.0%	
External Coating-FBE	-27.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	
Heavy Wall Pipe for crossings	-23.5%	-23.5%	-26.3%	-27.0%	-27.0%	-27.0%	-24.2%	-18.6%	-19.0%	-19.0%	-19.0%	
SubTotal Material Costs (\$/m)												
Subtotal Installation Costs (\$/m)	-5.0%	-5.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	
Total Assessable Costs per M												

Table 4.1 Carbon Steel, ANSI 600 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	2.8	2.8	2.8	3.2	4	5.2	6.4	6.4	7.8	8.2	9.5	8.2
Schedule/Grade	290	290	290	290	290	290	290	290	290	290	290	359
Metric O.D (mm)	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457	508	559
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m												
Subtotal Land Costs (\$/m)												
Preliminary engineering												
Route Reconnaissance												
Environmental												
Archeological												
Geotechnical												
As-Built Drawings												
Commissioning												
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)												
Man-Made Crossings												
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)												
Pipe costs	28.4%	30.4%	30.9%	31.4%	31.4%	31.4%	30.8%	2.7%	1.4%	1.3%	2.7%	0.3%
External Coating-FBE	11.1%	8.8%	12.2%	7.5%	6.8%	4.4%	-6.1%	-16.8%	-18.0%	-22.9%	-22.9%	-22.2%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	30.9%	31.4%	31.4%	31.4%	30.8%	2.7%	1.4%	1.3%	2.7%	0.3%	1.7%	-23.5%
Sub/Total Material Costs (\$/m)												
Subtotal Installation Costs (\$/m)	-20.0%	-20.0%	-20.0%	-20.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Total Assessable Costs per M												
	Note: Costs in red are excluded from the assessable cost											

Table 4.1 Carbon Steel, ANSI 600 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	9.5	9.5	9.5	10.3	10.3	10.3	11.1	11.9	12.7	14.3	15.9
Schedule/Grade	359	359	386	386	414	448	448	483	550	550	550
Metric O.D (mm)	610	660	711	762	813	864	914	1067	1219	1422	1524
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m											
Subtotal Land Costs (\$/m)											
Preliminary engineering											
Route Reconnaissance											
Environmental											
Archeological											
Geotechnical											
As-Built Drawings											
Commissioning											
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)											
Man-Made Crossings											
Subtotal Natural Crossings (\$/m)											
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)											
Pipe costs	1.7%	-23.5%	-24.2%	-24.2%	-27.6%	-29.7%	-28.3%	-28.9%	-23.5%	-18.1%	-16.4%
External Coating-FBE	-27.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	-24.2%	-24.2%	-27.6%	-29.7%	-28.3%	-28.9%	-23.5%	-18.1%	-16.4%	-16.4%	-16.4%
Sub/Total Material Costs (\$/m)											
Subtotal Installation Costs (\$/m)	-5.0%	-5.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%
Total Assessable Costs per M											

Table 4.1 Carbon Steel, ANSI 900 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	2.8	2.8	3.2	4	4.8	6.4	7.1	7.8	8.2	9.5	10.3	10.3
Schedule/Grade	290	290	290	359	359	359	359	359	386	386	386	414
Metric O.D (mm)	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457	508	559
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m												
Subtotal Land Costs (\$/m)												
Preliminary engineering												
Route Reconnaissance												
Environmental												
Archeological												
Geotechnical												
As-Built Drawings												
Commissioning												
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)												
Man-Made Crossings												
Subtotal Natural Crossings (\$/m)	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)												
Pipe costs	28.4%	30.4%	31.4%	31.0%	31.1%	31.1%	30.5%	0.5%	0.8%	0.8%	0.8%	-0.1%
External Coating-FBE	11.1%	8.8%	12.2%	7.5%	6.8%	4.4%	-6.1%	-16.8%	-18.0%	-22.9%	-22.9%	-22.2%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	31.4%	31.0%	31.1%	31.1%	30.5%	0.5%	0.8%	0.8%	0.8%	-0.1%	-0.1%	-25.6%
SubTotal Material Costs (\$/m)												
Subtotal Installation Costs (\$/m)	-20.0%	-20.0%	-20.0%	-20.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Total Assessable Costs per M												
Note: Costs in red are excluded from the assessable cost												

Table 4.1 Carbon Steel, ANSI 900 -32 km, 2009 % Study

Model Used	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km	32 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	12.7	12.7	12.7	12.7	14.3	12.7	12.7	15.1	18.3	20.6	21.4
Schedule/Grade	414	448	448	483	483	550	550	550	550	550	550
Metric O.D (mm)	610	660	711	762	813	864	914	1067	1219	1422	1524
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m											
Subtotal Land Costs (\$/m)											
Preliminary engineering											
Route Reconnaissance											
Environmental											
Archeological											
Geotechnical											
As-Built Drawings											
Commissioning											
Legal Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Design, Spec's,Procure.	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drainage Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Drawings	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Management	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Inspection	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Construction Surveying	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Subtotal Eng. Costs (\$/m)											
Man-Made Crossings											
Subtotal Natural Crossings (\$/m)											
Radiography	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
Seeding	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
100 Swamp Weights (500m wet)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Sack Breakers (1500 Sand Bags)	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Posts,Test Leads,Signs	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
Subtotal Misc. Mat'l Costs (\$/m)											
Pipe costs	-0.1%	-25.6%	-25.6%	-26.2%	-26.2%	-26.1%	-26.1%	-25.0%	-13.9%	-8.0%	-19.0%
External Coating-FBE	-27.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cost of A/G Assemblies	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%	-7.0%
Heavy Wall Pipe for crossings	-25.6%	-26.2%	-26.2%	-26.1%	-26.1%	-25.0%	-13.9%	-8.0%	-19.0%	-19.0%	-19.0%
SubTotal Material Costs (\$/m)											
Subtotal Installation Costs (\$/m)											
Total Assessable Costs per M											

Table 4.7 Carbon Steel ANSI 900- 300 km, 2009 % Study

Model Used	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km	300 km
Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Wall Thickness	7.1	7.8	8.2	9.5	10.3	10.3	12.7	12.7	12.7	12.7	14.3	12.7	12.7	15.1	18.3	20.6	21.4
Imperial O.D (inches)	359	359	386	386	386	414	414	448	448	483	483	550	550	550	550	550	550
Metric O.D (mm)	323.9	355.6	406.4	457	508	559	610	660	711	762	813	864	914	1067	1219	1422	1524
land - entry fee/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - damages/m	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
land - acquisition/m																	
Subtotal Land Costs (\$/m)																	
Preliminary engineering																	
Route Reconnaissance																	
Environmental																	
Archeological																	
Geotechnical																	
As-Built Drawings																	
Commissioning																	
Legal Surveying	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%
Design, Spec's,Procure.	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Drainage Drawings	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Drawings	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Construction Management	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Inspection	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Construction Surveying	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%
Subtotal Eng. Costs (\$/m)																	
Man-Made Crossings																	
Subtotal Natural Crossings (\$/m)	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%
Radiography	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%
Seeding	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%
1000 Swamp Weights (5000m wet)	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%
Sack Breakers (15000 Sand Bags)	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%
Posts,Test Leads,Signs	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%
Subtotal Misc. Mat'l Costs (\$/m)																	
Pipe costs	20.50%	-9.50%	-9.20%	-9.20%	-9.20%	-9.90%	-9.90%	-35.60%	-35.60%	-36.20%	-36.20%	-36.10%	-36.10%	-35.00%	-23.90%	-18.00%	-29.00%
External Coating-YJI or FBE	-11.10%	-21.80%	-23.00%	-27.90%	-27.90%	-27.20%	-32.10%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Cost of A/G Assemblies	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%	-12.00%
Heavy Wall Pipe for crossings	-4.20%	-4.20%	-4.20%	-4.90%	-4.90%	-30.60%	-30.60%	-31.20%	-31.20%	-31.10%	-31.10%	-30.00%	-18.90%	-13.00%	-24.00%	-24.00%	-24.00%
SubTotal Material Costs (\$/m)																	
SCADA & Leak Detection																	
Subtotal Installation Costs (\$/m)	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-13.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Total Assessable Costs per M																	
	Note: Costs in red are excluded from the assessable cost																
	2-300km pipe material is discounted by 10.0% over 32 km pipe material costs.																
	3-300km pipe coating material is discounted by 5% over 32 km pipe material coating costs.																
	4-300km pipe installation cost is discounted by 08% over 32 km pipe installation costs.																
	5-All External Coating is FBE, for substantial cost savings.																
	6-All Engineering, Misc Materials, Radiography, A/G Assemblies and Heavy Wall Pipe is discounted by 5% over the 32 km pipe costs																

Table 4.14 MDPE- 5 km
2009 % Study

Model Used	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km
Material	MDPE	MDPE	MDPE	MDPE	MDPE	MDPE	MDPE	MDPE	MDPE
Wall Thickness	W.T. 2.42	W.T. 3.04	W.T. 3.82	W.T. 4.38	W.T. 5.48	W.T. 8.08	W.T. 10.32	W.T. 15.28	W.T. 19.94
Imperial O.D (inches)	1.05	1.31	1.66	1.9	2.37	3.5	4.5	6.63	8.63
Metric O.D (mm)	26.7	33.4	42.2	48.3	60.3	88.9	114.3	168.3	219.1
land - entry fee/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - damages/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - acquisition/m									
Subtotal Land Costs (\$/m)									
Preliminary engineering									
Route Reconnaissance									
Environmental									
Archeological									
Geotechnical									
As-Built Drawings									
Commissioning									
Legal Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Design, Spec's,Procure.	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drainage Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Management	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Inspection	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Subtotal Eng. Costs (\$/m)									
Man-Made Crossings									
Subtotal Natural Crossings	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Radiography	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Seeding	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
20 Swamp Weights (100m wet)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Sack Breakers (300 Sand Bags)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Posts,Test Leads,Signs	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Subtotal Misc. Mat'l Costs									
Pipe	11.80%	22.60%	85.50%	61.90%	61.80%	50.20%	49.60%	47.30%	71.30%
Fittings/Valves	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Joining Material	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tracer Wire	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SubTotal Material Costs (\$/m)									
Subtotal Installation Costs (\$/m)	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-15.00%	-15.00%	-15.00%
Total Assessable Costs per M									
NOTE: Costs in Red are excluded from the assessable costs per metre									

Table 4.14 HDPE- 5 km
2009 % Study

Model Used	5 km	5 km	5 km	5 km
Material	HDPE	HDPE	HDPE	HDPE
Wall Thickness	46.18	69.27	73.88	61.39
Imperial O.D (inches)	20	30	32	42
Metric O.D (mm)	508	762	813	1067
land - entry fee/m	0.00%	0.00%	0.00%	0.00%
land - damages/m	0.00%	0.00%	0.00%	0.00%
land - acquisition/m				
Subtotal Land Costs (\$/m)				
Preliminary engineering				
Route Reconnaissance				
Environmental				
Archeological				
Geotechnical				
As-Built Drawings				
Commissioning				
Legal Surveying	-8.00%	-8.00%	-8.00%	-8.00%
Design, Spec's,Procure.	-5.00%	-5.00%	-5.00%	-5.00%
Drainage Drawings	-5.00%	-5.00%	-5.00%	-5.00%
Drawings	-5.00%	-5.00%	-5.00%	-5.00%
Construction Management	-5.00%	-5.00%	-5.00%	-5.00%
Inspection	-5.00%	-5.00%	-5.00%	-5.00%
Construction Surveying	-8.00%	-8.00%	-8.00%	-8.00%
Subtotal Eng. Costs (\$/m)				
Man-Made Crossings				
Subtotal Natural Crossings (\$/m)	-8.00%	-8.00%	-8.00%	-8.00%
Radiography	-8.00%	-8.00%	-8.00%	-8.00%
Seeding	-7.00%	-7.00%	-7.00%	-7.00%
20 Swamp Weights (100m wet)	-7.00%	-7.00%	-7.00%	-7.00%
Sack Breakers (300 Sand Bags)	-7.00%	-7.00%	-7.00%	-7.00%
Posts,Test Leads,Signs	-7.00%	-7.00%	-7.00%	-7.00%
Subtotal Misc. Mat'l Costs (\$/m)				
Pipe	-11.90%	14.70%	14.70%	17.40%
Fittings/Valves	0.00%	0.00%	0.00%	0.00%
Joining Material	0.00%	0.00%	0.00%	0.00%
Tracer Wire	0.00%	0.00%	0.00%	0.00%
SubTotal Material Costs (\$/m)				
Subtotal Installation Costs (\$/m)	-15.00%	-15.00%	-15.00%	-15.00%
Total Assessable Costs per				

Table 4.14 Fiberglass- 5 km
2009 % Study

Model Used	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km
Material	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass
Wall Thickness	2	2.8	3.6	5.1	8.9	5.1	5.1	16.25	16.25
Imperial O.D (inches)	2.37	3.5	4.5	6.63	8.63	10.75	12.75	24	36
Metric O.D (mm)	60.3	88.9	114.3	168.3	219.1	273.1	323.9	609.6	914.4
land - entry fee/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - damages/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - acquisition/m									
Subtotal Land Costs (\$/m)									
Preliminary engineering									
Route Reconnaissance									
Environmental									
Archeological									
Geotechnical									
As-Built Drawings									
Commissioning									
Legal Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Design, Spec's,Procure.	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drainage Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Management	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Inspection	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Subtotal Eng. Costs (\$/m)									
Man-Made Crossings									
Subtotal Natural Crossings (\$/m)	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Radiography	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Seeding	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
20 Swamp Weights (100m wet)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Sack Breakers (300 Sand Bags)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Posts,Test Leads,Signs	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Subtotal Misc. Mat'l Costs (\$/m)									
Pipe	29.00%	16.90%	12.80%	4.60%	3.20%	-5.70%	-2.60%	21.00%	23.50%
Fittings/Valves	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Joining Material	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tracer Wire	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SubTotal Material Costs (\$/m)									
Subtotal Installation Costs (\$/m)	-15.00%	-15.00%	10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Total Assessable Costs per M									
NOTE: Costs in Red are excluded from the assessable costs per metre									

Table 4.14 PVC- 5 km
2009 % Study

Model Used	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km	5 km
Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Imperial O.D (inches)	15.9	19.8	25	32.5	19.1	23.7	29.9	38.9	22.2	27.5	34.8	25.3	31.5
Metric O.D (mm)	750	750	750	750	900	900	900	900	1050	1050	1050	1200	1200
land - entry fee/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - damages/m	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
land - acquisition/m													
Subtotal Land Costs (\$/m)													
Preliminary engineering													
Route Reconnaissance													
Environmental													
Archeological													
Geotechnical													
As-Built Drawings													
Commissioning													
Legal Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Design, Spec's,Procure.	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drainage Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Drawings	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Management	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Inspection	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%	-5.00%
Construction Surveying	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Subtotal Eng. Costs (\$/m)													
Man-Made Crossings													
Subtotal Natural Crossings (\$/m)	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Radiography	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Seeding	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
20 Swamp Weights (100m wet)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Sack Breakers (300 Sand Bags)	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Posts,Test Leads,Signs	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%	-7.00%
Subtotal Misc. Mat'l Costs (\$/m)													
Pipe	-17.20%	-10.70%	-17.80%	-16.00%	-16.50%	-9.30%	-14.00%	-17.50%	-17.30%	-9.70%	-19.50%	-10.10%	-10.60%
Fittings/Valves	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Joining Material	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tracer Wire	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SubTotal Material Costs (\$/m)													
Subtotal Installation Costs (\$/m)	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%
Total Assessable Costs per M													
NOTE: Costs in Red are excluded from the assessable costs per metre													