

National Energy
Board



Office national
de l'énergie

User Guide

16 August 2017

Abandonment Cost Estimates Review 2016

Canada

Table of Contents

1.0	Introduction	4
2.0	Contents of this User Guide	4
3.0	Inputting data into the spreadsheet	5
3.1	Tab 1: Pipelines	5
3.1.1	Steps 1-14.....	5
3.2	Tab 2: Special treatment	9
3.2.1	Steps 16-18.....	9
3.3	Tab 3: Above-ground facilities	10
3.3.1	Steps 19-24.....	10
3.4	Tab 4: Post-abandonment	12
3.4.1	Steps 25-32.....	12
3.5	Tab 5: Summary	14
3.5.1	Steps 33-34.....	14
4.0	Land use, crossing, and above-ground facility categories	14
4.1	Land use categories.....	15
4.2	Crossing categories.....	17
4.3	Above-ground facility categories.....	18
5.0	Cost categories	19
5.1	Calculation methodology and descriptions for each category.....	19
5.2	Post-abandonment monitoring.....	21
5.3	Post-abandonment – other	22
5.4	Cost contingency	23
Appendix 1: Units of measurement/definitions.....		24
Appendix 2: Guidance for land use study		26
1.	Land use study methodology	26
2.	Categorization of pipeline system.....	27
3.	Categorization of above-ground facilities.....	28
4.	Land-use study report	28
Appendix 3: Supporting assessments and information.....		29
1.	Pipeline system description	29
2.	Already abandoned pipelines.....	29
3.	Identification of any locations where pipeline is expected to be removed or special treatment	30
4.	Land acquisition agreement assessment	30
5.	Known contaminated site assessment.....	31
6.	Average segmentation length.....	31

Appendix 4: Proposed guidance for consultation and mitigating impacts on current and future land uses33

- 1. Pipeline system description 33
- 2. Possible approaches to mitigating impacts to current and future land uses 33

Document Revisions34

1.0 Introduction

This User Guide outlines the steps required to complete the spreadsheet as part of the refined Abandonment Cost Estimate (ACE) framework. The spreadsheet has been developed to ensure consistency among companies and to ensure a standard approach to the ACE calculations. It also reflects some new approaches and refinements to the ACE, for example, the reporting of the lengths of pipeline by land use category, pipeline diameter, and commodity. Furthermore, it provides better alignment between land use categorization, abandonment assumptions and unit costs than the existing Base Case Tables A-1 to A-3, leading to consistent and more transparent cost estimates for all companies.

The spreadsheet captures all of the ACE inputs electronically and replaces the existing Board's Base Case Tables A-1 to A-4, with some additional refinements. The spreadsheet cannot be completed without the User Guide, because the User Guide outlines the supporting information necessary to input data into the spreadsheet. The spreadsheet includes embedded formulas.

The purpose of this User Guide is to assist all companies filing an ACE achieve three objectives:

- Input of data into the spreadsheet in a consistent manner (see sections 3 to 5);
- Use of supporting information required for inputting data into the spreadsheet (see Appendices 2, 3 and 4); and
- Use of standard definitions and measurements (found throughout the User Guide and in Appendix 1).

2.0 Contents of this User Guide

Section 3.0 of this User Guide provides an overview of the general instructions for inputting data in each Tab of the spreadsheet. Screenshots of the spreadsheet are also provided that show a component of the tables in each Tab. Each screenshot includes large red numbers that label the relevant data described in the adjacent column of the spreadsheet.

Section 4.0 of the User Guide provides additional definitions, descriptions and context to the companies when conducting their land use studies in support of their future ACEs, as well as for reporting length of pipe, number of above-ground facilities and unit costs in the spreadsheet.

Section 5.0 of the User Guide reflects a broad category of costs associated with pipeline abandonment activities, and provides guidance to the companies on the calculation methods and description of what each cost category should include.

Appendix 1 provides definition of terms and units of measurement to be used when completing the spreadsheet and the accompanying information. Appendices 2 and 3 provide guidance to companies for providing a land use study and other supporting assessments. Appendix 4 outlines guidance for consultation, and possible approaches for mitigating impacts to current and future land uses.

3.0 Inputting data into the spreadsheet

There are five (5) Tabs in the spreadsheet to be completed by companies:

- Tab 1: Pipelines
- Tab 2: Special Treatment
- Tab 3: Above-Ground Facilities
- Tab 4: Post-Abandonment
- Tab 5: Summary

For each Tab, this section of the User Guide provides an overview of the general instructions for inputting data. There are also screenshots of the spreadsheet that show a component of the larger tables in the Tab. Each screenshot includes large red numbers that label the relevant data described in the adjacent column of the table. (Note that these red number labels do not appear in the spreadsheet.)

For all dollar value inputs in the spreadsheet, a company should ensure that the costs reflected are in present dollars.

Section 3.0 does not include all instructions needed to complete the spreadsheet. Refer to additional definitions of the Land use, crossing and above-ground facilities categories found in section 4.0. Additional definitions of the Cost categories are found in section 5.0. The required supporting information is found in Appendices 2 and 3.

3.1 Tab 1: Pipelines

3.1.1 Steps 1-14

Tab 1 is where companies report total length of pipelines found in each of the land use categories by pipeline diameter category (small <14", medium 14" to 24", and large >24"), and by commodity (oil, gas and other commodity).

Land use classification instructions:

Land use classification must be conducted as per the methodology described in Appendix 2 of this User Guide (Guidance for land use study). The Board expects companies to provide detailed notes explaining entries, where necessary.

Length of pipe instructions:

- The total length of pipeline calculated by the spreadsheet in this tab should equal the total length of the pipeline system, as measured at the ground surface. Actual buried pipe length may be greater than this value.

- For crossing lengths, report the length of the crossing, as seen at the ground surface.
- Do not report buried utility crossings in this table. Instead report the land use found above those crossings at the ground surface.
- The length of pipeline reported in each land use category must be reported by commodity type (oil, gas, and other) and pipeline diameter class (small, medium and large).
- If there are no lengths of pipeline to be reported in any particular field in the table, enter zero in the field.

Abandonment method instructions:

There are two columns in the spreadsheet:

- percentage of abandon in-place; and,
- percentage of pipe removal.

Companies are to follow the abandonment assumptions embedded in the spreadsheet.

The assumptions are applied to each land use category by the length of pipe reported by companies for each land use category. The spreadsheet shows the total pipe to be abandoned in-place and removed in columns in the table. For new categories, the Board has applied the Base Case assumption from the most relevant Base Case land use category.¹

Unit cost instructions:

Input the unit costs calculated as described in section 5.0 of this User Guide.

Regardless of the assumptions, companies must provide unit costs for segmentation and removal for each category.

Salvage value for pipeline removal instructions:

If the pipeline is to be removed the pipeline removal cost category should not include salvage value. That is a separate line item and should be entered as a total estimate. This estimate would need to be broken into small, medium and large pipeline removal salvage value estimates. Include this breakdown in the notes to the spreadsheet.

¹ The Base Case abandonment method assumptions will be reviewed and potentially modified by the Board based on the evidence heard from participants to date and at the Technical Conferences in Fall 2017.

Screenshot		Description Steps 1-4		
Small (<14") 1	Categorization of Land Use along Pipeline System and Unit Costs: Small (<14") 1			
	2 Land Use Categorization	Agricultural	Cultivated	
			Non-Cultivated	
			With Special Features	
		Existing Developed Lands	Higher Density	
			Lower Density	
		Prospective Future Development	Industrial	
			Commercial	
			Residential	
		Protected Areas		Timber Harvesting Areas
		Non-Developed Lands	Native Prairie	
			Forested Land	
Crossings	Watercourses			
	Wetlands & Peatlands			
	Railways			
	Paved Roads and Highways			
Gravel Roads				
Total Length of Pipeline System by Size				
		3 Contingency (%)		
	4 Total Salvage Value of Removed Small Pipe			
Net Cost per Category				

1: The tab is broken down into three tables based on pipeline diameter category (small <14", medium 14" to 24", and large >24").

2: Each table is further broken down by the land use.

3 & 4: Separate from land use, each table requires contingency percentages for each cost category and total salvage value of any pipe.

Screenshot		Description Steps 5-6	
Categorization of Land Use along Pipeline System and Unit Costs: Small (<14")		Length of Pipe - Oil (km) 5	Length of Pipe - Gas (km)
Agricultural	Cultivated		
	Non-Cultivated	6	
	With Special Features		

5: Each column identifies the units being used in parenthesis below the title.

6: Light blue fill is used to indicate cells requiring data input from companies. All other cells are calculated automatically.

Screenshot				Description Steps 7-9	
Categorization of Land Use along Pipeline System and Unit Costs: Small (<14")			Abandonment Method Assumption		7: All abandonment assumptions are fixed and will comprise of a per cent of pipeline assumed to left in-place and a per cent to be removed. 8: Regardless of the assumptions, companies must provide unit costs for segmentation and removal for each category. [Note: the assumptions currently shown are Base Case] 9: The Board has applied the Base Case assumption from the most relevant Base Case land use category.
			Abandon In-Place (%) 7	Pipe Removal (%)	
Land Use Categorization	Agricultural	Cultivated	80%	20%	
		Non-Cultivated	80%	20%	
		With Special Features	0%	100%	
	Existing Developed Lands	Higher Density	100%	0%	
		Lower Density	100% 8	0%	
	Prospective Future Development	Industrial	0%	100%	
		Commercial	0%	100%	
		Residential	0%	100%	
	Protected Areas	Timber Harvesting Areas	0% 9	100%	
	Non-Developed Lands	Native Prairie	100%	0%	
		Forested Land	80%	20%	
		Watercourses	100%	0%	

Screenshot				Description Steps 10-14		
Categorization of Land Use along Pipeline System and Unit Costs: Small (<14")		Pipeline Removal (\$/km) 10	Land Remediation (\$/km) 11			
			Oil	Gas	Commodity	
Land Use Categorization	Agricultural	Cultivated				
		Non-Cultivated				
		With Special Features				
	Existing Developed Lands	Higher Density				
		Lower Density				
	Prospective Future Development	Industrial				
		Commercial				
		Residential				
	Protected Areas	Timber Harvesting Areas				
	Non-Developed Lands	Native Prairie				
		Forested Land				
	Crossings	Watercourses				
		Wetlands & Peatlands				
		Railways				
Paved Roads and Highways						
	Gravel Roads					
Total Length of Pipeline System by Size						
	Contingency (%)		12			
Total Salvage Value of Removed Small Pipe		13				
Net Cost per Category		\$0	\$0	\$0 14	\$0	

Screenshot		Description Step 15
		15: The total displayed at the top of the tab does not include salvage value.

3.2 Tab 2: Special treatment

3.2.1 Steps 16-18

Tab 2 captures the data for special treatment by pipeline diameter. The tables in Tab 2 are used to calculate the costs of special treatment (fill).

Special treatment is calculated on a \$/m³ of fill material basis by land use category. It includes costs for:

- Mobilization and demobilization of equipment and personnel;
- Cutting, capping and filling of pipeline with fill material; and
- Cost of material used to fill pipe.

The Tab has two fixed fill assumptions² using the current Base Case assumptions:

- percentage of pipe that will be abandoned in-place with no fill;
- percentage of pipe that will be abandoned in-place with fill.

Special treatment instructions:

Report the total lengths of pipe by crossing type and pipeline diameter class for those lengths that would require special treatment (fill), if the associated special treatment assumption is for some percentage of fill (other than zero).

For those crossing types where the special treatment assumption is not zero per cent (i.e., partial or total fill), companies must measure the distance of each applicable crossing on their pipeline system, in terms of the distance of pipe that would need to be filled at the time of abandonment. These segments should then be added up by crossing category and pipeline diameter class, and reported in the appropriate fields.

² The fill assumptions will be reviewed and potentially modified by the Board based on the evidence heard from participants to date and at the Technical Conference(s) in Fall 2017.

Note: the crossing lengths measured for reporting lengths in this table may be longer than the crossing lengths reported in Tab 1 (Pipelines) of the spreadsheet since the length of fill may need to extend for some distance either side of the crossing to be effective.

If the special treatment assumption is zero, companies do not need to report the total length of pipe for that crossing category.

Enter the unit cost (in \$/km) for filling pipe by crossing type.

Screenshot					Description Steps 16-18
Special Treatment - Length of Pipe Requiring Fill Small (<14") 16		Total Distance of Pipe Requiring Fill (km) 17	Fill Assumption		Unit Costs for Filling Pipe by Crossing Type (\$/km of fill)
			Abandon in Place - No Fill (%) 18	Abandon in Place - Fill (%)	
Crossings	Watercourses		100%	0%	
	Wetlands/Peatlands		100%	0%	
	Railways		0%	100%	
	Paved Roads & Highways		0%	100%	
	Gravel Roads		0%	100%	
	Utilities (buried)		100%	0%	
	Contingency (%)				
TOTAL		0 km			

16: The Special treatment tab is also broken down into three tables based on pipe diameter category.
17: Enter length of pipeline requiring fill.
18: All special treatment assumptions are fixed by the Board and will comprise of a percentage of pipeline assumed to be filled and not filled.

3.3 Tab 3: Above-ground facilities

3.3.1 Steps 19-24

Tab 3 captures the data for above-ground facilities. The tables in Tab 3 are used to calculate the costs of abandoning above-ground facilities.

Above-ground facility categorization instructions:

Categorize all above-ground facilities by type, as described in section 4.0 of the User Guide. Use the unit of measurement specified in the spreadsheet.

All costs calculated in Tab 3 assume 100 per cent removal of above-ground facilities.

Abandonment costs to be considered at each above-ground facility include purging, cleaning, removal, demolition and hauling of all above-ground facilities and associated piping, appurtenances, equipment, utilities, supports and foundations.

The Board notes that, at above-ground facilities with footprints that extend off-right of way (RoW) and which are likely not to be needed by the company upon abandonment (e.g., meter stations, pump stations and compressor stations), costs associated with restoring lands to an equivalent

land capability (or as per the requirements of any applicable acquisition agreements) and fully remediating any soil contamination are important considerations when estimating abandonment costs.

Calculation of abandonment costs related to land reclamation and remediation at these type of facilities are calculated separately in Tab 3 (Above-ground facilities) in the “Unit Costs for Restoration and Remediation at Meter Stations, Pump Stations and Compressor Stations by Land use” table. Land reclamation costs should include costs for: decompacting soils, replacing topsoil and re-vegetating the land surface, as appropriate.

Unit costs for restoration and remediation at meter stations, pump stations and compressor stations by land use table instructions:

Report the total area (in m²) of the footprint of all meter stations, pump stations and compressor stations in the applicable column by land use category.

- The land use at each station should be determined by considering the surrounding land use and land restoration goals upon abandonment of the facility.
- Follow the methodology described in Appendix 2 (Guidance for land use study) of the User Guide to classify land use.

Enter the unit cost (in \$/ m²) for meter stations, pump stations and compressor stations in the applicable column by land use category.

Removal of above-ground facilities table instructions:

Report in the “Total Units” column the total number of the following facility types:

- Processing plants (by MMcf);
- Oil Terminal and Storage Facilities (by bbl);
- Compressors (by MW);
- Meter Stations (by number of stations); and
- Pumps (by HP).

Enter the unit cost (in \$/ unit) for each facility type.

For processing plants and oil terminal and storage facilities include any restoration and remediation costs in the unit cost reported for that facility type.

Salvage value instructions:

Enter the total salvage value on the applicable row for any above-ground facilities to be salvaged. In the notes provide the breakdown of salvage value for specific items.

Salvage value is entered as a total, not a unit basis. Salvage value is independent of the individual cost categories for above-ground facilities.

Screenshot		Description Steps 19-20			
Dark grey cells are intentionally blank.		Meter Stations			
Unit Costs for Restoration and Remediation at Meter Stations, Pump Stations and Compressor Stations by Land-Use		Meter Stations - Footprint in Square Metres (m²) 19	Meter Stations - Land Restoration (\$/m²) 20	Meter Stations - Land Remediation (\$/m²)	Meter Station Land Restoration and Remediation Total Cost - by land use
Land Use Categorization	Agricultural	Cultivated			\$0
		Non-Cultivated			\$0
		With Special Features			\$0
	Existing Developed Lands	Higher Density			\$0
		Lower Density			\$0
	Prospective Future Development	Industrial			\$0
		Commercial			\$0
		Residential			\$0
		Aboriginal Land Claims Areas			\$0
	Protected Areas	Timber Harvesting Areas			\$0
					\$0
	Non-Developed Lands	Native Prairie			\$0
Forested Land				\$0	
Contingency (%)					
TOTAL		0 m²			\$0

19: The first table is broken down into Meter Stations, Compressor Stations, and Pump Stations, Total area (in square metres) of the station's footprint by land use category.
20: Enter unit costs in \$/m².

Screenshot		Description Steps 21-24			
Removal of Above Ground Facilities (type of unit)		Total Units	\$/unit	Contingency (%)	Total Cost
Processing Plants (by MMcf)					\$0
Oil Terminal & Storage Facilities (by bbl) 21		22	23		\$0
Compressors (by MW)					\$0
Meter stations (by Number of stations)					\$0
Pumps by Horse Power (HP)					\$0
Total Removal Costs					\$0
Total Salvage Value					24
Net Removal Costs					\$0

21: In the second table, the units used for each row are listed in parenthesis.
22: Enter the total units.
23: Enter unit cost.
24: Enter salvage value.

3.4 Tab 4: Post-abandonment

3.4.1 Steps 25-32

Tab 4 captures the data for Post-Abandonment monitoring and other Post-Abandonment costs. See sections 5.2 and 5.3 for further description.

Screenshot							Description Steps 25-27			
<table border="1"> <tr> <td>Post-Abandonment Total</td> <td>\$0</td> <td>25</td> </tr> </table>					Post-Abandonment Total	\$0	25			25: Displays the total for the tab
Post-Abandonment Total	\$0	25								
<table border="1"> <tr> <td>Real Return on Funds for calculating Present Value</td> <td>1.50%</td> <td>26</td> </tr> </table>					Real Return on Funds for calculating Present Value	1.50%	26			26: Uses the Board's base case of 3.5 per cent return less inflation of 2 per cent. Any entries higher than 1.5 per cent real return on funds will generate an error message.
Real Return on Funds for calculating Present Value	1.50%	26								
Annual Monitoring Costs	Type of Expense	Number	Unit	Unit Cost	Unit	Annual Total (\$/year)	Year Zero Value For Entire Period (2017 \$)			
	Aerial Patrols (Flights)		Flights/year		\$/flight	\$0	\$0			
	Signage Maintenance (Days)		Days/year		\$/day	\$0	\$0			
	Environmental Remediation of Disturbed Areas, Years 1-5 (Events)	27	Days/year		\$/day	\$0	\$0			
	Environmental Remediation of Disturbed Areas, Years 6-10 (Events)		Days/year		\$/day	\$0	\$0			
	Database Maintenance				\$/year	\$0	\$0			
	Property Taxes & Insurance				\$/year	\$0	\$0			
	Security				\$/year	\$0	\$0			
	Management Fee				% of total		\$0			
	Total Requirement to Fund Post-Abandonment Monitoring							\$0		
							27: Environmental Monitoring and Remediation requirements and the length over which activities must take place vary by land use. Provide supporting information.			

Screenshot										Description Steps 28-32																																																																																																																																																																																																																																																														
<table border="1"> <tr> <td colspan="2">Post Abandonment Other</td> <td>Period Start (year)</td> <td>Period End (year)</td> <td>Estimated Annual Frequency of Events per Kilometre (event/km)</td> <td>Remaining Pipeline Length (km)</td> <td>Annual Number of Events (#)</td> <td>Length of Pipe Removed per Event (km/event)</td> <td>Cost per Event (\$/event)</td> <td>Annual Cost (Nominal \$)</td> <td>Year Zero Value For Entire Period (2017 \$)</td> </tr> <tr> <td rowspan="10">Post Abandonment Time Frame</td> <td>Period 1</td> <td>28</td> <td>29</td> <td>1</td> <td>5</td> <td>0.0 km</td> <td></td> <td>31</td> <td></td> <td>32</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>6</td> <td>10</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>6</td> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>11</td> <td>40</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>11</td> <td>40</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>41</td> <td>80</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>41</td> <td>80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>81</td> <td>140</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>81</td> <td>140</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>141</td> <td>260</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>141</td> <td>260</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - requiring pipe removal</td> <td>261</td> <td>1000</td> <td></td> <td>0.0 km</td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Event - pipe remains</td> <td>261</td> <td>1000</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="2">Period Totals on Annual Basis</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td colspan="10">Total Requirement to Fund Post-Abandonment Events</td> <td>\$0</td> </tr> <tr> <td colspan="10">Remaining Pipe in Year 1000</td> <td>0</td> </tr> </table>										Post Abandonment Other		Period Start (year)	Period End (year)	Estimated Annual Frequency of Events per Kilometre (event/km)	Remaining Pipeline Length (km)	Annual Number of Events (#)	Length of Pipe Removed per Event (km/event)	Cost per Event (\$/event)	Annual Cost (Nominal \$)	Year Zero Value For Entire Period (2017 \$)	Post Abandonment Time Frame	Period 1	28	29	1	5	0.0 km		31		32	Event - requiring pipe removal									\$0	Event - pipe remains									\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		6	10		0.0 km				\$0	Event - pipe remains		6	10						\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		11	40		0.0 km				\$0	Event - pipe remains		11	40						\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		41	80		0.0 km				\$0	Event - pipe remains		41	80						\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		81	140		0.0 km				\$0	Event - pipe remains		81	140						\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		141	260		0.0 km				\$0	Event - pipe remains		141	260						\$0	Period Totals on Annual Basis						0			\$0	Event - requiring pipe removal		261	1000		0.0 km				\$0	Event - pipe remains		261	1000						\$0	Period Totals on Annual Basis						0			\$0	Total Requirement to Fund Post-Abandonment Events										\$0	Remaining Pipe in Year 1000										0	28: The post-abandonment time frame is divided into time periods. For each, enter estimated annual averages over the period of years indicated in Period Start and Period End Columns. Year 1 is the first year following the abandonment of the pipeline.
Post Abandonment Other		Period Start (year)	Period End (year)	Estimated Annual Frequency of Events per Kilometre (event/km)	Remaining Pipeline Length (km)	Annual Number of Events (#)	Length of Pipe Removed per Event (km/event)	Cost per Event (\$/event)	Annual Cost (Nominal \$)	Year Zero Value For Entire Period (2017 \$)																																																																																																																																																																																																																																																														
Post Abandonment Time Frame	Period 1	28	29	1	5	0.0 km		31		32																																																																																																																																																																																																																																																														
	Event - requiring pipe removal									\$0																																																																																																																																																																																																																																																														
	Event - pipe remains									\$0																																																																																																																																																																																																																																																														
	Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																														
	Event - requiring pipe removal		6	10		0.0 km				\$0																																																																																																																																																																																																																																																														
	Event - pipe remains		6	10						\$0																																																																																																																																																																																																																																																														
	Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																														
	Event - requiring pipe removal		11	40		0.0 km				\$0																																																																																																																																																																																																																																																														
	Event - pipe remains		11	40						\$0																																																																																																																																																																																																																																																														
	Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																														
Event - requiring pipe removal		41	80		0.0 km				\$0																																																																																																																																																																																																																																																															
Event - pipe remains		41	80						\$0																																																																																																																																																																																																																																																															
Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																															
Event - requiring pipe removal		81	140		0.0 km				\$0																																																																																																																																																																																																																																																															
Event - pipe remains		81	140						\$0																																																																																																																																																																																																																																																															
Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																															
Event - requiring pipe removal		141	260		0.0 km				\$0																																																																																																																																																																																																																																																															
Event - pipe remains		141	260						\$0																																																																																																																																																																																																																																																															
Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																															
Event - requiring pipe removal		261	1000		0.0 km				\$0																																																																																																																																																																																																																																																															
Event - pipe remains		261	1000						\$0																																																																																																																																																																																																																																																															
Period Totals on Annual Basis						0			\$0																																																																																																																																																																																																																																																															
Total Requirement to Fund Post-Abandonment Events										\$0																																																																																																																																																																																																																																																														
Remaining Pipe in Year 1000										0																																																																																																																																																																																																																																																														
										29 & 30: The types of events that could occur are divided into events requiring removal of pipe previously abandoned in-place, and events after which the pipe remains in place.																																																																																																																																																																																																																																																														
										31: Enter the estimated cost per event in present day dollars.																																																																																																																																																																																																																																																														
										32: Year Zero Value column calculates the present value for all annual expenses incurred in a given period.																																																																																																																																																																																																																																																														

3.5 Tab 5: Summary

3.5.1 Steps 33-34

Tab 5 is a summary of Tabs 1-4.

Screenshot			Description Steps 33-34																																																																								
<table border="1"> <thead> <tr> <th>Abandonment Cost Summary 33</th> <th>Pipeline Length</th> <th>Costs by Category</th> </tr> </thead> <tbody> <tr> <td><i>Abandonment Activities (excluding Contingency)</i></td> <td>0.0 km</td> <td>\$0</td> </tr> <tr> <td>Engineering & Project Management 34</td> <td></td> <td>\$0</td> </tr> <tr> <td>Land Access</td> <td></td> <td>\$0</td> </tr> <tr> <td>Purging and Cleaning</td> <td></td> <td>\$0</td> </tr> <tr> <td>Land Remediation</td> <td></td> <td>\$0</td> </tr> <tr> <td>Land Restoration</td> <td></td> <td>\$0</td> </tr> <tr> <td><i>Pipeline Abandonment-in-Place (excluding Contingency)</i></td> <td>0.0 km</td> <td>\$0</td> </tr> <tr> <td>Segmentation</td> <td></td> <td>\$0</td> </tr> <tr> <td>Special treatment</td> <td>0.0 km</td> <td>\$0</td> </tr> <tr> <td><i>Pipeline Removal (excluding Salvage & Contingency)</i></td> <td>0.0 km</td> <td>\$0</td> </tr> <tr> <td><i>Above-ground facilities (excluding Salvage & Contingency)</i></td> <td></td> <td>\$0</td> </tr> <tr> <td>Post Abandonment</td> <td></td> <td>\$0</td> </tr> <tr> <td>Post Abandonment Monitoring</td> <td></td> <td>\$0</td> </tr> <tr> <td>Post Abandonment Other</td> <td></td> <td>\$0</td> </tr> <tr> <td>Contingency</td> <td></td> <td>\$0</td> </tr> <tr> <td>Pipelines (incl. Special Treatment)</td> <td></td> <td>\$0</td> </tr> <tr> <td>Above Ground Facilities</td> <td></td> <td>\$0</td> </tr> <tr> <td>Salvage</td> <td></td> <td>\$0</td> </tr> <tr> <td>Removed Pipe</td> <td></td> <td>\$0</td> </tr> <tr> <td>Above Ground Facilities</td> <td></td> <td>\$0</td> </tr> <tr> <td>Total Abandonment Cost Estimate</td> <td></td> <td>\$0</td> </tr> <tr> <td>Total Salvage Value</td> <td></td> <td>\$0</td> </tr> <tr> <td>Net Abandonment Cost Estimate</td> <td></td> <td>\$0.00</td> </tr> </tbody> </table>			Abandonment Cost Summary 33	Pipeline Length	Costs by Category	<i>Abandonment Activities (excluding Contingency)</i>	0.0 km	\$0	Engineering & Project Management 34		\$0	Land Access		\$0	Purging and Cleaning		\$0	Land Remediation		\$0	Land Restoration		\$0	<i>Pipeline Abandonment-in-Place (excluding Contingency)</i>	0.0 km	\$0	Segmentation		\$0	Special treatment	0.0 km	\$0	<i>Pipeline Removal (excluding Salvage & Contingency)</i>	0.0 km	\$0	<i>Above-ground facilities (excluding Salvage & Contingency)</i>		\$0	Post Abandonment		\$0	Post Abandonment Monitoring		\$0	Post Abandonment Other		\$0	Contingency		\$0	Pipelines (incl. Special Treatment)		\$0	Above Ground Facilities		\$0	Salvage		\$0	Removed Pipe		\$0	Above Ground Facilities		\$0	Total Abandonment Cost Estimate		\$0	Total Salvage Value		\$0	Net Abandonment Cost Estimate		\$0.00	<p>33: No data should be entered on this tab, it is solely for totalling and information purposes.</p> <p>34: Engineering and Project Management is calculated based off of the total length of the pipeline. (See section 5.1)</p>
Abandonment Cost Summary 33	Pipeline Length	Costs by Category																																																																									
<i>Abandonment Activities (excluding Contingency)</i>	0.0 km	\$0																																																																									
Engineering & Project Management 34		\$0																																																																									
Land Access		\$0																																																																									
Purging and Cleaning		\$0																																																																									
Land Remediation		\$0																																																																									
Land Restoration		\$0																																																																									
<i>Pipeline Abandonment-in-Place (excluding Contingency)</i>	0.0 km	\$0																																																																									
Segmentation		\$0																																																																									
Special treatment	0.0 km	\$0																																																																									
<i>Pipeline Removal (excluding Salvage & Contingency)</i>	0.0 km	\$0																																																																									
<i>Above-ground facilities (excluding Salvage & Contingency)</i>		\$0																																																																									
Post Abandonment		\$0																																																																									
Post Abandonment Monitoring		\$0																																																																									
Post Abandonment Other		\$0																																																																									
Contingency		\$0																																																																									
Pipelines (incl. Special Treatment)		\$0																																																																									
Above Ground Facilities		\$0																																																																									
Salvage		\$0																																																																									
Removed Pipe		\$0																																																																									
Above Ground Facilities		\$0																																																																									
Total Abandonment Cost Estimate		\$0																																																																									
Total Salvage Value		\$0																																																																									
Net Abandonment Cost Estimate		\$0.00																																																																									

4.0 Land use, crossing, and above-ground facility categories

This section of the User Guide provides additional definitions, descriptions and context to companies when conducting their land use studies in support of their future ACEs, as well as for reporting length of pipe, number of above-ground facilities and unit costs in the spreadsheet.

Refer to Appendix 2 for guidance on the methodology and information sources to be used to categorize land use and crossings.

4.1 Land use categories

Land use Category	Land use Sub-Category	Description	Considerations/Context
Agricultural	Lands which are used for agricultural purposes.		
	Cultivated	Lands which are either currently cultivated or show signs of recent cultivation (i.e., within past 5 years).	This category does not include agricultural lands with special features.
	Non-Cultivated	Lands which have not been recently cultivated (i.e., within past 5 years), and where sod has developed or is beginning to develop and which is used for animal grazing or other agricultural purposes.	This category does not include agricultural lands with special features, or grazing areas in native prairie or forested lands.
	With Special Features	Lands where: <ul style="list-style-type: none"> • there are agricultural activities requiring maintenance of an adequate depth of cover to ensure there is no interaction with an abandoned pipe; • there is the presence of buried drainage tile; or • there is the presence of flood irrigation. 	These could include, but not be limited to: <ul style="list-style-type: none"> • deep tilling operations • tree farms • turf farms • irrigation • field drainage systems In general, if the agricultural activities will result in a depth of cultivation greater than 45 cm below the surface of the ground, or if the depth of agricultural activities is greater than 30 cm and may result in a reduction in the depth of cover over the pipe that is less than when the pipeline was constructed, these areas should be reported in this land use category.
Existing Developed Lands	Lands within municipalities (e.g., cities, towns, villages, hamlets) and where lands adjacent to (i.e., within 200 m) the pipeline RoW or above-ground facilities are currently built up with concentrated areas of residential, commercial and/or industrial development.		
	Higher Density	Adjacent lands are highly developed	It is likely that, upon abandonment, there will be a high demand for redeveloping the lands upon which the pipeline RoW or above-ground facilities are located as a result of the surrounding land use, even if current land use planning and development documents do not indicate so at this time.

Land use Category	Land use Sub-Category	Description	Considerations/Context
	Lower Density	Areas where adjacent lands are developed, but not at a high density	It is likely that, upon abandonment, there will be a low demand for redeveloping the lands upon which the pipeline RoW or above-ground facilities are located, as a result of the surrounding land use.
Prospective Future Development	Currently undeveloped lands where commercial, industrial or residential growth or proposed activities may impact the pipeline or above-ground facility at the time of abandonment.		
	Industrial Development	Lands where the primary activity involves the production, manufacture, or construction of goods.	Includes lands for which: <ul style="list-style-type: none"> • there are publically-available plans outlining plans for land redevelopment or re-zoning; or • the company, through ongoing consultation, is aware of proposed future activities or development on private and/or Crown lands.
	Commercial Development	Lands where the primary activity includes the buying and selling of goods and services.	
	Residential Development	Lands where dwellings for human habitation predominate. These areas include land uses that are integral and supportive of a residential environment.	
Protected Areas		Lands with protective designations, as identified in government regulation, and for which development is not permitted or is limited.	These could include, but are not limited to: <ul style="list-style-type: none"> • national, provincial and regional parks; • federal and provincial lands with protective designations (e.g., wildlife preserves, ecological reserves); and • designated Critical Habitat for species on Schedule 1 of the <i>Species at Risk Act</i>.
			Non-Developed Lands
Native Prairie	Grasslands comprised mainly of native grass species with some shrubland cover.	Native prairie areas which either have not been previously developed, or were temporarily disturbed in the past but are being left to naturally regenerate back to	

Land use Category	Land use Sub-Category	Description	Considerations/Context
			native prairie. Maybe used as rangeland for cattle grazing.
	Forested Land	Lands which are predominantly forested and which may be suitable for timber harvesting.	Forested areas which either have not been previously developed, or were temporarily disturbed in the past but are being left to naturally regenerate back to a forested state (e.g., forestry cutblocks, pipeline RoWs, seismic lines).

4.2 Crossing categories

Land use Category	Description	Considerations
Watercourses	Crossings of all watercourses with defined beds and banks. Includes rivers, streams, creeks and crossings of waterbodies such as lakes and ponds.	As confirmed to be present as a result of a field-based assessment or as determined from the aerial imagery used to delineate the pipeline system (minimum scale of 1:5000). This category does not include intermittent or seasonal drainages which have been cultivated or are vegetated swales.
Wetlands and Peatlands	All wetlands and peatland areas, as determined by an appropriate wetland classification system.	As determined by using: <ul style="list-style-type: none"> the appropriate federal and provincial wetland classification systems for the region the pipeline system is located in (e.g., The Canadian Wetland Classification System, Alberta Wetland Classification System, Wetlands of British Columbia – A Guide to Identification); and the results of a field-based assessment, or as determined from the aerial imagery used to delineate the pipeline system (minimum scale of 1:5000).
Railways	Railways for the movement of trains.	Includes railway bed and associated bar ditches.
Paved Roads and Highways	Paved roadways for the movement of vehicular traffic.	Includes road bed and associated bar ditches.

Land use Category	Description	Considerations
Gravel Roads	Gravel roadways for the movement of vehicular traffic.	Includes road bed and associated bar ditches.
Other Utilities (Buried)	Buried utilities used to transport of electricity, water, natural gas and liquid hydrocarbons and other products.	

4.3 Above-ground facility categories

Category	Description
Meter Stations	A facility used to measure the quantity of service fluid flowing through piping, including meters, controls, piping, buildings and other appurtenances.
Compressor Stations	A facility used primarily to increase the pressure in a gas pipeline system, including: piping, auxiliary devices (e.g., compressors, drivers, control instruments, enclosures, ventilating equipment and utilities), and any associated buildings other than residences.
Pump Stations	A facility used to pump oil industry fluids, including pumps, drivers, controls, piping and other appurtenances.
Terminals	A facility that is constructed for the storage of oil and includes the land and other works connected with the facility.
Gas Processing Plants	A plant used for the processing, extraction or conversion of fluids and all structures located within the boundaries of the plant, including compressors and other structures integral to the transportation of fluids.
Block Valves	A valve for isolating laterals, stations, pressure-relieving installations, a segment of a pipeline and other facilities. It includes manual and automated valves.
Above-Ground Storage Tanks	A tank that sits on or above the ground and is installed in a fixed location.
Pressure Vessels	A vessel that is designed for the containment of fluids at internal gauge pressures of more than 103 kPa, has an internal volume of more than 42.5 L and has an internal diameter of more than: <ul style="list-style-type: none"> (a) 152 mm, if it is not in water service; or (b) 610 mm, if it is in water service
Other	Other above-ground facilities included in the company's system which are not listed or included in categories above.

5.0 Cost categories

This section reflects a broad category of costs associated with pipeline abandonment activities. Refer to this section to complete Tab 1 of the spreadsheet.

For all dollar value inputs in the spreadsheet and when updating its ACE, a company should ensure that the costs reflected are in current dollars. To do this, companies should use the approach to be determined at the Technical Conference(s).

Regarding the annuity factor to be used in calculating post-abandonment costs, the Board has indicated a Base Case annuity factor of 66:1. This is based on the 4 March 2010 Revised Base Case return on funds of 3.5 per cent less 2 per cent inflation, resulting in a real return on funds of 1.5 per cent. The real return is capped at 1.5 per cent; however, companies may request to use a real return on funds lower than per cent, which would impact the annuity factor accordingly.

5.1 Calculation methodology and descriptions for each category

	Cost Category	Calculation method	Description (what each cost category should include)
1	Engineering and Project Management	<p>20 per cent of sum total of cost categories 2, 3, 4, 5, 6, 7, special treatment and total abandonment cost for above ground facilities cost for pipelines <50 km.</p> <p>10 per cent of sum total of cost categories 2, 3, 4, 5, 6, 7, special treatment and total abandonment cost for above ground facilities cost for pipelines 50 – 500 km.</p> <p>5 per cent of sum total of cost categories 2, 3, 4, 5, 6, 7, special treatment and total abandonment cost for above ground facilities cost for pipelines > 500 km.</p>	<ul style="list-style-type: none"> • Regulatory, legal, finance, external relations, land, SH&E, and operations support. • Stakeholder consultation activities. • Cost estimation activities, planning, and detailed engineering and environmental studies. • Engineering, project and construction management. • Procurement and project quality assurance.
2	Land Access	Calculated on a \$/km basis separately for small, medium and large diameter pipelines by land use category	<ul style="list-style-type: none"> • Access rights and permits. • Establishing temporary work spaces. • Surveying activities. • GIS updates. • Discharge rights.
3	Purging and Cleaning	Calculated on a \$/km basis separately for small, medium and large diameter pipelines by	<ul style="list-style-type: none"> • Emptying pipeline of service fluids. • Pipeline pigging, cleaning and purging in a manner that leaves no mobile materials

	Cost Category	Calculation method	Description (what each cost category should include)
		land use category and commodity.	<p>remaining in the pipelines.</p> <ul style="list-style-type: none"> • Pipeline cleanliness verification via laboratory testing and analysis. • Storage and disposal of wastes.
4	Abandonment In-Place	Calculated on a \$/km basis separately for small, medium and large diameter pipelines by land use category.	<ul style="list-style-type: none"> • Mobilization and demobilization of equipment and personnel. • Cutting, capping and effectively sealing the pipelines. • Installation of plugs to prevent water movement and mitigate water conduit effects. • Testing for site contamination. • Removal of underground appurtenances.
5	Pipeline Removal	Calculated on a \$/km basis separately for small, medium and large diameter pipelines by land use category.	<ul style="list-style-type: none"> • Mobilization and demobilization of equipment and personnel. • Removal of impediments – clearing of the RoW. • Topsoil stripping. • Excavation of pipelines and appurtenances. • Cutting and capping of pipelines. • Stockpiling, loading and hauling of removed pipelines. • Disposal of removed pipelines. • Backfill and compaction of disturbed soils.
6	Land Remediation	Calculated on a \$/km (pipeline) or \$/m ² (facility sites) basis by land use category, pipeline diameter category and commodity.	To remediate any known areas of contamination along the pipeline RoWs or within the property boundaries at meter stations, compressor stations and pump stations.
7	Land Restoration	Calculated on a \$/km (pipeline) basis by land use category and pipeline diameter category.	<p>Costs to reclaim the ground surface of the entire pipeline RoW (not just areas of anticipated to be disturbed during abandonment activities) to equivalent land use of adjacent lands, or as per the requirements of any applicable acquisition agreements:</p> <ul style="list-style-type: none"> • Removing gravel and paved areas from facility sites • Recontouring facility sites • Alleviating any sub-soil compaction • Replacing topsoil • Re-vegetating the land

5.2 *Post-abandonment monitoring*

This is the costs associated with conducting periodic surveillance and monitoring on the RoW of the abandoned in place pipelines and facilities. It also includes the cost of inspection and maintenance activities aimed at ensuring the restored and re-vegetated RoW is developing appropriately.

The unit costs estimates are associated with the following monitoring activities as applicable:

- Aerial patrol – calculated on a \$/year based on:
 - Expected number of flights to be conducted each year.
 - Cost of each flight based on associated assumptions including but not limited to: average duration of flight, equipment rental, pilot/operator labor rates, miscellaneous.

Activity	# of flights/year	\$/flight	\$/year	# of years
Aerial Patrol				

- Signage maintenance – calculated on a \$/year based on:
 - Number of days per year crews inspect and maintain company signage on the RoW.
 - Number of person crews expected to perform signage maintenance and labour rates.
 - Equipment and other miscellaneous costs.

Activity	Days/year	\$/day	\$/year	# of years
Signage Maintenance				

- Database maintenance – calculated on a \$/year based on:
 - Cost to maintain and update database of abandoned pipelines and facilities.

Activity	\$/year	# of years
Database Maintenance		

- Third-party crossing administration – calculated on a \$/year based on:
 - Provisions for one-call services and costs to administer 3rd party inquiries and requests.

Activity	\$/year	# of years
Third-party crossing administration		

- Security – calculated on a \$/year based on:
 - Cost to adequately secure above-ground facilities not completely removed.
 - Number of manned security personnel required and labour rates.
 - Equipment and other miscellaneous costs.

Activity	\$/year	# of years
Security		

- Management Fees – calculated on a \$/year basis as determined by company as fees paid to external parties to manage post-abandonment monitoring obligations.
- Property Taxes and Insurance – calculated on a \$/year basis.

5.3 Post-abandonment – other

The financial provision to address unforeseen events in the future, which may require remedial action (e.g., reburial of the pipeline, removal of portions of abandoned pipelines). Such events include (but not limited to):

- Ground subsidence;
- Soil erosion;
- Pipe displacement at slopes or water crossings;
- Discovery of contamination;
- Depth of cover issues;
- Tile drainage issues;
- Formation of water conduits;
- Pipe exposure; and
- Any other problems caused by the presence of an abandoned pipeline.

Companies are expected to estimate the costs associated with addressing the types of unforeseen events including potential removal.

Calculated on a \$/year (annual cost) basis for distinct periods based on an estimated annual event frequency (event/km), total pipeline system length (km), annual number of events and cost per event (\$/event).

- Period 1: 0 – 5 years
- Period 2: 6 – 25 years
- Period 3: 26 – 40 years
- Period 4: 41 – 100 years
- Period 5: > 101 years

5.4 *Cost contingency*

Cost contingency is calculated as a percentage and is based on the accuracy of the cost estimate for each cost category, thereby compensating for unit cost estimate inaccuracies. The percentage may be determined by companies based on project experience, expert judgment, modeling and simulation analysis and other corporate methodologies.

Appendix 1: Units of measurement/definitions

Definition of Terms and Units of Measurement to be used when completing the spreadsheet and the accompanying information:

Term	Unit of Measurement	Definition
Abandonment Assumption		Refers to whether a pipeline will be assumed to remain in-place or be removed (or a combination of the two) at the time of abandonment, for the purposes of estimating abandonment costs.
Abandon In-Place (A)		Pipeline that will remain in-place at the time of abandonment.
Above-ground facilities	By Unit Specified in section 4.3 of this User Guide	Includes all facilities which are located above-ground on the pipeline RoW or within facility sites (e.g., gas processing sites, meter station), or which partially extend below grade to the pipeline (e.g., valves).
Annuity Factor	66:1	Uses a real inflation rate of 1.5 per cent (3.5 per cent return on funds less the 2 per cent inflation rate) as set out in the 4 th March 2010 Revised Base Case.
Crossings	Km (to one decimal place/nearest 100 m)	Areas where the pipeline system crosses roads, wetlands, peatlands, highways, paved roads, gravel roads and buried utilities.
Small Diameter Pipeline Category		2 to 12 inches (60.3 to 323.9mm) outside diameter
Medium Diameter Pipeline Category		14 to 24 inches (355.6 to 610 mm) outside diameter
Large Diameter Pipeline Category		Greater than 24 inches (660 mm) outside diameter
Facility Area	Hectares (to one decimal place)	Fence-line area of facility sites that extend off-RoW.
Pipeline Length	Km (to one decimal place/nearest 100 m)	Lengths of pipeline in a company's pipeline system which have been categorized by land use or crossing category.
Pipeline Removal (R)		Pipeline will be removed at the time of abandonment.
RoW		Right-of-Way

Term	Unit of Measurement	Definition
Revised Base Case Estimated Cost Factor Value	Current year \$	
Salvage		The value at removal of pipe and facilities.
Segmentation		Locations where the pipeline will be cut and capped at the time of abandonment to isolate the pipe from operating systems, allow for removal of above-ground facilities, and to prevent the pipe acting as a conduit for water and soil if it remains in-place.
Special Treatment (A+)		Locations where the pipeline will be filled with concrete or other non-porous material to prevent pipe collapse or the pipe acting as a conduit for water and soil if it remains in-place.
Special Treatment Assumption		Refers to whether a pipeline will be assumed to have special treatment applied at the time of abandonment for the purposes of estimating abandonment costs (e.g. at crossings).
Volumes of Crude Oil, Natural Gas Liquids and Natural Gas	Cubic meters to the nearest 5 cubic meters	
Energy Conversion Tables	Use: http://www.nbone.gc.ca/nrg/tl/cnvrntbl/cnvrntbl-eng.html#s1	

Appendix 2: Guidance for land use study

Companies must complete an assessment of current and future land use along their pipeline systems, and other information to support ACE filings. These assessments will be conducted in consideration of the following:

- Land use studies will need to be re-conducted by all companies for their next ACE using the methodology outlined below.
- The assessments will provide the rationale for the required values reported in Tabs 1-4 of the spreadsheet.
- The supporting information will provide the ability for the Board and other interested persons to fully understand the pipeline lengths reported in the spreadsheet in a transparent manner.

1. Land use study methodology

- Categorization of land use will be conducted using either a field-based or desktop assessment techniques.
- Categorization will use the land use categories described in sections 4.1 and 4.2 of this User Guide.
- Assessments will be conducted by professionals with the appropriate qualifications and experience to accurately assess land use. The qualifications and experience of the individuals who conducted the work must be provided in the land use study report.

Desktop assessments

- Desktop assessments will be conducted by visually interpreting appropriately-scaled satellite or aerial imagery, and using other sources of information (see below) and company knowledge, as appropriate, to supplement and guide the assessment.
- A list of the imagery sources used, including the scale and imagery date of each source, must be included in the land use study report.
- Imagery must be of an appropriate scale and age to allow for accurate identification of land use type and detection of land use change: a minimum scale of 1:5,000 and less than 3 years old (from time of assessment).
- Use of publically available imagery (e.g., GoogleEarth, Streetview, etc.) is considered appropriate, if date(s) of imagery capture (as noted in the program) and assessment are provided.
- Any limitations in the imagery must be noted in the land use study report.
- Companies must demonstrate in the land use study report that they have a verified the results of their land use assessment for inconsistencies and errors, using quality assurance and quality control techniques such as spot checks and field verification.

Field-based assessments

- Provide a detailed description in the land use report of how the assessment was conducted (e.g., aerial assessment, on-ground assessment), dates conducted and any limitations of the assessment (e.g., areas not visited, areas not assessed).

Other information sources

For both field-based and desktop assessments, the Board expects companies to use other information sources and/or consultation to verify land use. This information is already a requirement of NEB-regulated companies as per section 16(b) of Part II of the *National Energy Board Pipeline Damage Prevention Regulations*, which requires “ongoing monitoring of any changes in the use of the land on which a pipeline is located and the land that is adjacent to that land”. These information sources may include plans for development (e.g., urban expansion), and/or plans for protection of lands (i.e., conservation projects).

These sources of information should include, at a minimum:

- Consultation with landowners;
- Consultation with Indigenous peoples, including any land claim areas;
- Available federal, provincial, regional or municipal land use reports;
- Consultation with appropriate agencies for areas where available land use reports are not current or not readily available; and,
- Planning documents and/or consultation with appropriate agencies regarding areas with ongoing or planned conservation efforts (e.g. parks, natural areas, ecological areas, wetland conservation, species of concern critical habitat).

2. Categorization of pipeline system

Categorize the pipeline system using the methodology described above and the land use and crossing categories described in sections 4.1 and 4.2 of the User Guide.

Summary table (Categorization of pipeline system)

- Provide a summary table which shows a break-down of the pipeline system by:
 - land use and crossing category;
 - pipeline diameter class; and
 - commodity (oil, gas, or other commodity).

Note: The total length of pipe reported in this table should equal the total length of the pipeline system as measured at the ground surface.

The values reported in this table are to be used to report lengths of pipe in the various land use and crossing categories in Tab 1 of the spreadsheet. Refer to section 3.1.1 of this User Guide for instructions on how to do this.

3. Categorization of above-ground facilities

Categorize all above-ground facilities by facility type. For meter stations, pump stations and compressor stations, also assess the lands immediately adjacent to the facility to determine an appropriate land use “equivalent”.

Facility type categories and their corresponding units of measurement are described in section 4.3 of the User Guide. Land use categories are described in the section 4.1 of the User Guide.

Summary Table (Categorization of above-ground facilities)

- Provide a summary table which shows the total number of above-ground facility by type and in the unit of measurement specified in section 4.3 of the User Guide.
- Provide a summary table which shows the total footprint (in m²) of meter stations, pump stations and compressor stations by land use type (e.g., equivalent to the land use adjacent to the stations).

The values reported in these tables are to be used to report the total area of by land use type of meter stations, pump stations and compressor stations in first table of Tab 3 of the spreadsheet, as well as the total number of above-ground facilities by type in the second table of Tab 3. Refer to section 3.3.1 of this User Guide for instructions on how to do this.

4. Land-use study report

- Clearly describe the methodology used to conduct the land use assessment.
- List the information sources (including date published) and records of consultation (including date of consultation) used to inform land use categorization.
- Identify any known information gaps.

Appendix 3: Supporting assessments and information

The following information will help the Board assess over time the appropriateness of the Board-fixed abandonment assumptions for each land use, crossing and above-ground facility category and company-provided unit costs, and determine if adjustments to those assumptions and costs need to be made.

1. Pipeline system description

Briefly description of the various pipelines located within a company's system, including:

- name of each pipeline;
- length (in km);
- current operating status of each pipeline: Operating, Deactivated, Decommissioned or Abandoned (for those pipelines abandoned since *Pipeline Safety Act* came into effect in July 2016);
- commodity transported (e.g., oil, gas, other); and
- an overview map showing the location of each pipeline.

2. Already abandoned pipelines

For all pipelines and above-ground facilities in the company's system that have been abandoned since July 2016 (implementation of Bill C-46 and Board's oversight of abandoned pipes), provide the following information:

- The name of the pipelines or facilities abandoned (including NEB Order number); and,

For abandoned pipelines, include:

- the type of commodity that was shipped last (e.g., oil, gas, other);
- the total length of the pipeline;
- an explanation of the abandonment methods used, including:
 - length of pipe abandoned in-place;
 - length of pipe removed; or
 - length of pipe filled;
- for the sections of pipe that were removed, an explanation of the factors that resulted in a decision to remove pipe;
- any issues related to historical contamination; and
- an explanation as to whether land was reclaimed to equivalent land use capability (or other regulatory requirements).

For abandoned above-ground facilities, include:

- total number of facilities abandoned by type;
- explanation of the abandonment methods used (e.g., removal, partial removal, left in-place);
- any issues related to historical contamination; and
- an explanation as to whether land was reclaimed to equivalent land use capability (or other regulatory requirements).

3. Identification of any locations where pipeline is expected to be removed or special treatment

Conduct a review of the pipeline system to identify any areas where it is currently known that the pipeline will likely need to be removed or special treatment applied at the time of abandonment due to site-specific issues. These issues could include, but are not limited to:

- known geotechnical instability, due to unstable and eroding slopes and banks (e.g., watercourse crossings); and
- loss of depth of cover over the pipe due to water and wind erosion, scour, watercourse migration, lack of buoyancy control.

Summary table (Removal / special treatment)

For those locations where issues have been identified and either pipeline removal or special treatment is likely to be required at the time of abandonment, provide a table which includes the following information for each issue type:

- Description of issue (e.g., slope instability, loss of depth of cover due to scour, etc.);
- Locations (by KP) where the issue has been identified;
- Total length (in km) of pipeline RoW affected or potentially affected by the issue; and
- A breakdown of the total length of pipeline that will likely require removal and the length that will require special treatment (fill).

4. Land acquisition agreement assessment

Conduct a review of all land acquisition agreements for the pipeline system to determine if there are any areas where pipe removal or special treatment may be required at the time of abandonment. These may include easements, servitudes, crossing permits, leases and licences.

Summary table (Land acquisition agreement)

For those land acquisition agreements which include stipulations regarding future abandonment method (e.g., removal, abandonment in-place with special treatment) for certain sections of pipeline, provide a summary table which categorizes the total length of affected pipe by:

- land acquisition agreement type; and
- abandonment method stipulated.

Note: Where a land acquisition agreement may result in a choice of abandonment method options, choose the more conservative method from a cost estimate perspective for reporting in the table above, and provide a supporting rationale for the abandonment method chosen.

5. *Known contaminated site assessment*

Conduct a review of the pipeline system and above-ground facilities to determine there are any areas of known historical contamination or for which ongoing remediation is occurring and which are close enough to the pipeline RoWs or facility sites for there to be a potential interaction at the time of abandonment.

Summary table (Known contaminated site)

For each location where historical contamination has been identified as a result of the above-mentioned assessment, provide a table with the following information:

- location of contamination (KP of pipeline system or name of station or plant);
- type of contamination;
- length (in km) of pipeline RoW or facility area (in hectares) affected or potentially affected by the contamination; and
- a brief explanation of whether it is currently known if pipe removal or application of special treatment (fill) may be required at the site at time of abandonment to reduce environmental effects.

6. *Average segmentation length*

Assess the terrain along the pipeline system and determine the total length of pipe (in km) by pipeline diameter category in each of the three following terrain categories:

- Flat terrain
- Moderate terrain
- Severe Terrain

Provide definitions for flat, moderate and severe terrain that best depict the conditions found on the company's pipeline system.

Provide a justification for how the average segmentation length is adequate for the terrain crossed by the pipeline system.

Summary table (Average segmentation)

Provide a summary table which shows the total length of pipeline by pipeline diameter category in each of the three terrain categories described above.

Appendix 4: Proposed guidance for consultation and mitigating impacts on current and future land uses

1. Pipeline system description

Provide a summary of consultation activities that have been undertaken for the ACE Review. This summary should include a description of:

- relevant discussions with directly affected landowners and stakeholders regarding land rights and the manner or weight in which this has been factored in to the abandonment method assumptions (such as removal versus abandon in-place);
- relevant discussions with Indigenous groups and how this has been factored in to the abandonment method assumptions (removal versus abandon in-place);
- a summary of the issues or concerns (e.g., environmental or safety) raised by landowners, Indigenous groups and stakeholders; and
- how companies maintain current records of land ownership information.

2. Possible approaches to mitigating impacts to current and future land uses

Provide a description of how values for types of current and future land uses were factored within cost estimates and how the plan was used by the company to consult and engage with landowners, stakeholders and Indigenous groups in order to determine and refine the company's costs since the last ACE Review filing. This description must include but not be limited to:

- the method used to assess the impacts to landowners, stakeholders, Indigenous groups on their current or proposed future use of the lands (such as agricultural operations, land development plans, etc.);
- the research performed in order to assess and quantify the costs associated with these impacts;
- a description of the typical mitigation measures that would be in place or considered to address impacts associated with the proposed method of abandonment;
- the method used to record and manage the data resulting from consultation activities with landowners, stakeholders and Indigenous groups in order to refine these estimates; and
- the manner in which the results of this information will be shared with landowners, stakeholders and Indigenous groups.

Document Revisions

Date	Version Number	Document Changes
08/16/2017	1	Original Draft