MEMO

TO: Edwin Makkinga
Enbridge Gas Distribution Inc.

FROM: David Restivo, ISA Certified Arborist (ON-1248A)
Dillon Consulting Limited

DATE: August 30, 2011

SUBJECT: Alliston Pipeline Reinforcement Tree Inventory and Condition Assessment

OUR FILE: 11 4371

Introduction

Dillon Consulting Limited (Dillon) has been retained by Enbridge Gas Distribution Incorporated (Enbridge) to complete an Environmental Assessment (EA) for a natural gas pipeline to reinforce the existing distribution network in the community of Alliston, in the Township of New Tecumseth, County of Simcoe. The EA involves route selection and an environmental and cumulative effects assessment for the new pipeline to identify any environmental or socio-economic impacts associated with the Preferred Route.

The Preferred Route for the proposed natural gas pipeline originates southeast of Highway 89 and Highway 27 (4174 15th Line) where it ties into the existing Cookstown Gate Station in the Town of Innisfil. It then proceeds within the road allowance west along 15th Line (also Victoria Street) to Dufferin Street. From this point it proceeds north to Highway 89 and then west along Highway 89 for approximately 8 kilometres (km) to Sideroad 10, Township of New Tecumseh.

In support of this EA, a tree inventory and condition assessment study was undertaken on June 10, 2011. The objective of the study was to inventory and assess the trees located in the study area. For the purposes of this technical memo, the study area is located in a residential neighbourhood from the Cookstown Gate Station to the intersection of Dufferin Street and Highway 89. Specifically, a tree inventory was completed on the south side of the 15th Line (Victoria Street) road right-of-way (ROW) and the west side of Dufferin Street ROW in Cookstown, Ontario. From the results of the inventory, typical impacts will be discussed and general mitigation measures will be prescribed in order to minimize damage to trees during construction.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Tree Bylaws

The Town of Innisfil does not have a tree bylaw. The County of Simcoe has a tree cutting bylaw (Bylaw No. 5289) that prohibits or regulates the destruction or injuring of trees in woodlands designated in the bylaw (i.e., > 1 ha). There is no County of Simcoe street tree bylaw.

Methodology

The methods used for the tree inventory and condition assessment included the following:

- Photo documentation of the landscape surrounding the trees inventoried (see **Photo Plates 1 - 8** at the end of this technical memo);
- Identification of the tree species;
- A measurement of the diameter of the trees at breast height (1.38 m);
- A condition assessment of the tree; and
- Application of an aluminium identification tag.

The condition rating system was based on a qualitative visual assessment of each tree by an ISA Certified Arborist. The hazard potential of trees was assessed using the method outlined in the International Society of Arboriculture's *A Photographic Guide to the Evaluation of Hazard Trees in Urban Area - 2nd Edition* (Mattheny and Clark 1994). Using this guide, an overall condition rating (i.e., dead, poor, fair, good or excellent) was given to this tree. These condition ratings are useful when evaluating the retention and/or replacement value of individual tree stands.

A description of each condition rating is as follows.

Dead – The specimen tree is considered dead when it has no living tissue

Hazard Tree – The specimen tree could either be alive or dead but poses a hazard to residents. These trees have the potential for splitting, breaking and/or falling over during inclement weather, and because of their proximity to residential neighbourhoods, could cause personal injury and/or severe damage to municipal infrastructure and private property.

Poor Condition – Trees in poor condition show major symptoms of decline. At least 50% of main scaffold branches are dead, missing or in diseased state. The trunk shows evidence of advanced rot, deadwood or is hollow throughout. Twig development on the main branches or through sucker growth is limited. Callus growth around wounds is minimal. A tree in poor condition could become a safety hazard and may require removal prior to development.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Fair Condition – Trees in fair condition show moderate symptoms of decline in lower canopy or scaffold branches, but at least 50% of scaffold branches are present and viable. Trunk shows limited evidence of rot or insect damage. Callus growth is present near wound areas. Trees that have scaffold branches that are healthy but are in a "Y" formation may also be included in this category if included bark is evident due to the risk of splitting or breakage as the tree matures. Removal or preservation of these trees depends on the location of the specimen and associated hazard potential and would depend on the species and its tolerance to grading, trenching and surviving in an urban environment. Some major arboricultural maintenance may be required in the future and may include major scaffold or secondary branch removal, bracing and/or cabling.

Good Condition - The specimen tree shows no symptoms of decline in the trunk, and all scaffold branches are present and are in good condition. Most scaffold branches are at right angles to the trunk, and show good vigour. Small amounts of dead wood may be present in secondary branches, but account for less than 25% of the canopy. Depending on the grading in the immediate area, a tree in good condition would be recommended for preservation. Such a tree would survive to maturity without major arboricultural maintenance.

Excellent Condition - The specimen tree shows no symptoms of decline in trunk, scaffold or secondary branches. Trees in this condition have an excellent growth habit and should survive to maturity without major arboricultural maintenance.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Tree Inventory Results

The study area contained a mixture of native and non-native landscape/hedgerow tree species. Fifty-two trees were documented on the southern side of the Victoria Street ROW and five trees were documented on the western side of the Dufferin Street ROW (see **Table 1**). Of these 57 trees, fourteen different species were identified, seven (50%) native to Ontario. The tally of native species is as follows:

- 1 Burning Bush (*Euonymus atropurpurea*)
- 34 Sugar Maple (*Acer saccharum*)
- 1 Red Maple (*Acer rubrum*)
- 3 Black Walnut (*Julgans nigra*)
- 1 White Pine (*Pinus strobus*)
- 2 White Ash (*Fraxinus americana*)
- 1 White Elm (*Ulmus americana*)

The remaining seven species are exotic (non-native). The tally of the non-native trees is as follows:

- 1 Siberian Elm (*Ulmus pumila*)
- 2 English Hawthorn (*Crataegus monogyna*)
- 1 Colorado Spruce (*Picea pungens*)
- 3 Norway Maple (*Acer platanoides*)
- 2 Norway Spruce (*Picea abies*)
- 3 Manitoba Maple (*Acer negundo*)
- 2 Apple.(*Malus* species)

Most of these trees were found to be in "Good" condition (45%), a third (33%) were in "Fair" condition, while the remaining trees (21%) were in "Poor" condition. The following four trees were determined to be "Hazard" trees:

- Tree Tag ID #507, Sugar Maple
- Tree Tag ID #527, Sugar Maple
- Tree Tag ID #536, Sugar Maple
- Tree Tag ID #546, Red Maple

Information regarding the tree species, diameter at breast height (DBH) and condition was recorded and provided in **Table 1**.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Table 1 – Alliston Pipeline Reinforcement Tree Inventory Results for Victoria Street and Dufferin Street in Cookstown

Tree ID Number	Common Name	Scientific Name	DBH (cm)	Condition	Live Crown (%)	Notes	Hazard Tree
501	Burning Bush	*Euonymus atropurpurea*	4	Good	75		
502	Siberian Elm	*Ulmus pumila*	9	Poor	10	Leaf discolouration. Dieback in secondary branches	
503	Sugar Maple	*Acer saccharum*	57	Fair	50	Dieback in secondary branches	
504	Sugar Maple	*Acer saccharum*	60	Good	80		
505	Sugar Maple	*Acer saccharum*	71	Good	75	Cavity in trunk	
506	Sugar Maple	*Acer saccharum*	78	Good	80		
507	Sugar Maple	*Acer saccharum*	69	Poor	40	Dieback in main scaffold and secondary branches	Yes
508	Sugar Maple	*Acer saccharum*	65	Good	90		
509	Sugar Maple	*Acer saccharum*	67	Good	90		
510	Sugar Maple	*Acer saccharum*	63	Poor	20	Dieback in main scaffold and secondary branches	
511	Sugar Maple	*Acer saccharum*	83	Good	90		
512	Sugar Maple	*Acer saccharum*	79	Good	90		
513	Sugar Maple	*Acer saccharum*	66	Good	80		
514	Sugar Maple	*Acer saccharum*	68	Fair	70	Deadwood in trunk, secondary branch dieback	
515	Sugar Maple	*Acer saccharum*	81	Good	90	Y-crotch at 3m	
516	Sugar Maple	*Acer saccharum*	94	Poor	30	Y-crotch at 3m	
517	Sugar Maple	*Acer saccharum*	53	Good	95		
518	English Hawthorn	*Crataegus monogyna*	10 - 15	Good	80	Multi-stemmed, 7 total stems	
519	Sugar Maple	*Acer saccharum*	66	Fair	70	Dieback in central leader	
520	Sugar Maple	*Acer saccharum*	72	Fair	80	Dieback in central leader	
521	Black Walnut	*Julgans nigra*	39	Fair	65	Dieback in secondary branches	
522	Black Walnut	*Julgans nigra*	14	Good	75		

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Tree ID Number	Common Name	Scientific Name	DBH (cm)	Condition	Live Crown (%)	Notes	Hazard Tree
523	Black Walnut	*Julgans nigra*	16	Good	80		
524	Sugar Maple	*Acer saccharum*	71	Fair	60	Dieback in secondary branches	
525	Sugar Maple	*Acer saccharum*	59	Poor	40	One scaffold branch dead	
526	Sugar Maple	*Acer saccharum*	61	Fair	70	Deadwood in centre of trunk	
527	Sugar Maple	*Acer saccharum*	43	Poor	10	Deadwood in centre of trunk	Yes
528	Sugar Maple	*Acer saccharum*	57	Good	80	Codominant stems	
529	Sugar Maple	*Acer saccharum*	67	Fair	65	Dieback in secondary branches	
530	Sugar Maple	*Acer saccharum*	70	Fair	70	Large cavity in trunk	
531	Sugar Maple	*Acer saccharum*	65	Good	85		
532	English Hawthorn	*Crataegus monogyna*	30,20	Good	90	Codominant stems	
533	Sugar Maple	*Acer saccharum*	75	Good	80	Centre leader top pruned	
534	Sugar Maple	*Acer saccharum*	71	Poor	40	Deadwood in trunk, rotting, large cavity in trunk, insect infestation	
535	Sugar Maple	*Acer saccharum*	14	Good	90		
536	Sugar Maple	*Acer saccharum*	66	Poor	50	Large cavity, deadwood, central leader dead	Yes
537	Colorado Spruce	*Picea pungens*	5	Good			
538	Sugar Maple	*Acer saccharum*	69	Poor	70	Dieback in secondary branches	
539	Norway Maple	*Acer platanoides*	43	Fair	75	Dieback in main stem	
540	Sugar Maple	*Acer saccharum*	63	Poor	50	central leader dead, major dieback on main scaffold braches	
541	Norway Spruce	*Picea abies*	53	Fair	60	Dieback in secondary branches	
542	Sugar Maple	*Acer saccharum*	70	Fair	70	Dieback in secondary branches	
543	Sugar Maple	*Acer saccharum*	68	Good	85		
544	Norway Maple	*Acer platanoides*	17,15,15	Good	90	Y Crotch at base, included bark at crotch, multi-stem	
545	Norway Maple	*Acer platanoides*	21	Good	80	Shaded by adjacent trees	
546	Red Maple	*Acer rubrum*	54	Poor	30	Northern Flicker nest in tree cavity;	Yes

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Tree ID Number	Common Name	Scientific Name	DBH (cm)	Condition	Live Crown (%)	Notes	Hazard Tree
						Dieback in main scaffold & secondary branches	
547	Norway Maple	*Acer platanoides*	56	Fair	60	Deadwood, insect infestation, rot	
548	Sugar Maple	*Acer saccharum*	81	Good	85	Large cavity in trunk, squirrel nest in cavity	
549	White Pine	*Pinus strobus*	44	Fair	65	Deadwood at base of tree	
550	White Ash	*Fraxinus americana*	35	Good	80		
551	White Ash	*Fraxinus americana*	30	Good	80		
552	Manitoba Maple	*Acer negundo*	34	Fair	65	Shaded by adjacent tree; Dieback in secondary branches	
553	Apple spp.	*Malus spp.*	18,18,15	Fair	85	3 stems; Dieback in secondary branches	
554	Apple spp.	*Malus spp.*	32	Fair	60	Dieback in secondary branches	
555	Manitoba Maple	*Acer negundo*	36,26	Poor	50	Dieback in secondary branches	
556	White Elm	*Ulmus americana*	7 to 10	Fair	75	Leaf discolouration, 7 stems	
557	Manitoba Maple	*Acer negundo*	7 to 10	Fair	70	Multi-stemmed	

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Potential Impacts to Trees

The most common type of damage to urban trees is root loss which is particularly poignant in urban environments due to the potentially limited space for root growth. Another potential impact to landscape trees is physical injury, which is often related to mechanical damage involving construction equipment and to improper root and crown pruning techniques.

Construction associated with the reinforcement of an underground utility typically involves the use of heavy equipment and trenching. Accordingly, the following construction activities have the potential to damage to trees in the study area:

Excavation
The practice of trenching for installation and maintenance of underground utility lines can mechanically damage the root system of a tree. Damaging a root system to a significant degree reduces water and nutrient uptake and may compromise the stability of the tree.

Soil Compaction and Grade Changes
Compaction of the soil either by design or due to locating access routes within root zones can affect root systems during construction. Similarly, the placement or removal of fill material within a root zone can result in root system impairments such as smothering. Trees require a loosely compact soil medium for root growth, oxygen uptake, and absorption of water and nutrients. Soil compaction and grading changes within the root zone can inhibit root growth and function, and these impacts have the potential to result in a decline in the overall condition of a tree.

Physical Damage
Accidental contact between construction equipment and trees can cause physical damage to the trunk and crown.

Mitigation Measures

The trees observed in the ROW were generally within two metres of the current gas pipeline and are at risk of being damaged during reinforcement activities. It is recommended that the following mitigation measures be considered in order to minimize damage to existing trees:

Minimizing Root Loss through Horizontal Directional Drilling
The use of horizontal directional drilling to tunnel under buttress roots instead of traditional trenching can reduce damage to roots and is recommended when access for installation and maintenance of underground utility lines is constrained by the proximity of trees.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Minimizing Root Loss through Directional Trenching

For trees that are setback from utility lines, directional trenching techniques may be sufficient to protect the majority of a tree's root system. Directional trenching involves concentrating the trench excavation to the side of the utility line opposite to the side where the tree is located.

Minimizing Root Loss through Hydrovac Excavation

Physical damage to root systems can be minimized through the use of Hydrovac Excavation. Hydrovac Excavation is the non-destructive process that uses pressurized water and a vacuum truck to remove soil and has a particularly useful application in exposing underground pipeline infrastructure and tree roots.

Minimizing Root Loss through the use of Proper Pruning and Maintenance Techniques

Exposed tree roots should be pruned in a manner that minimized physical damage and promotes quick wound closure and regeneration. Also, minimize tree damage by avoiding excavation during hot, dry weather; keeping the plants well watered before and after digging; and covering exposed roots with soil, mulch, or damp burlap as soon as possible.

Avoid Soil Compaction

Do not allow equipment, vehicles, or materials to be stored on the boulevard. Establish a separate staging and parking area away from the trees to avoid compaction of the soil. If this is not possible, cushion the boulevard with at least six inches of wood chips applied as mulch. In addition, do not allow any foreign materials to be buried or deposited into the boulevard soil.

Erecting Barriers

Establish tree protection zones by erecting barriers around trees in the construction area. The size of the tree protection zones should be proportional to the size of the tree. The fenced tree protection zone should be clear of building materials, waste, soil stockpiles and construction equipment. No digging, trenching, compaction, or other soil disturbance should be permitted in the tree protection zone.

Post-Construction Tree Maintenance

There are several post-construction tree maintenance options to repair damaged caused to trees by construction activities. These include, but are not limited to the following:

- Treating trunk and crown injuries (e.g., pruning, cabling, bracing, repairing wounds to damaged bark and trunks, etc.);
- Irrigation and drainage;
- Mulching; and
- Aeration of the root zone.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Summary and Recommendations

The majority (60%) of the 57 landscape and hedgerow trees documented from the Cookstown Gate Station to the intersection of Dufferin Street and Highway 89 along the south side of the 15th Line (Victoria Street) road right-of-way and the west side of Dufferin Street ROW in Cookstown were Sugar Maple. In total, fourteen tree species were identified in the study area, half of which are non-native. The condition of the trees was generally good to fair; however, a small portion of the trees inventoried were in poor condition, and four trees were identified as hazards.

The foregoing has discussed the potential impacts that could be realized when considering the construction activities proposed for the project. Since most of the trees are within a couple metres of the current gas pipeline, mitigation measures are recommended to minimize the damage to the tree root systems, trunks and crowns. It is also recommended that a survey of the trees in the study area be completed to identify their precise location so that viable mitigation options can be determined for each tree potentially affected by the project.

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

References

Farrar, John Laird. 1995. Trees in Canada. Eighth Impression 2003. Fitzhenry & Whiteside Limited, Markham, Ontario and the Canadian Forestry Service, Natural Resource Canada, Ottawa, in cooperation with Public Works and Government Services Canada.

Mattheny, Nelda P. and James R. Clark. 1994. A Photographic Guide to the Evaluation of Hazard Trees in Urban Area - 2nd Edition. International Society of Arboriculture.

Johnson, Gary R. 1999. Protecting Trees from Construction Damage: A Homeowner's Guide. University of Minnesota. Accessed Online July 27, 2011. URL:http://www.treecanada.ca/programs/urbanforestry/cufn/Resources_Non_Canadian/construction_damage_HomeownersGuide.pdf

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Photo Documentation of the Cookstown Study Area

Photo Plate #1 June 10, 2011 Dufferin Street looking south from Highway 89	
Photo Plate #2 June 10, 2011 Dufferin Street looking north from Victoria Street	

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Photo Plate #3 June 10, 2011 Victoria Street looking east from Dufferin Street	
Photo Plate #4 June 10, 2011 Victoria Street looking west from Highway 27	

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Photo Plate #5 June 10, 2011 Victoria Street looking east from Highway 27	
Photo Plate #6 June 10, 2011 Victoria Street looking west from Cook Street	

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692

Photo Plate #7 June 10, 2011 Victoria Street looking east from Cook Street	
Photo Plate #8 June 10, 2011 Victoria Street looking west from Cookstown Gate Station	

235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8 – Phone (416) 229-4646 -- Fax (416) 229-4692