TORONTO STAFF REPORT

August 22, 2006

To: Economic Development and Parks Committee

From: Brenda Librecz, General Manager, Parks, Forestry and Recreation

Subject: Tree Maintenance – Planting Programs
All Wards

Purpose:

This report provides information on the criteria and follow-up that governs how newly planted trees and shrubs are maintained and monitored to ensure their vitality and growth, and to identify the number of trees and shrubs that have died, the number that have been removed and the number that have been replaced.

Financial Implications and Impact Statement:

As part of the 2006 operating budget process, an additional $2 million was requested for the Urban Forestry budget to reduce tree service delays. $1.053 million was approved and the remaining $0.932 million was deferred. These funds are required to reduce tree service delays of mature and established trees. These funds are recommended to be included in Parks, Forestry and Recreation's 2007 operating budget submission and referred for consideration to the 2007 operating budget process.

In addition, for Urban Forestry to be in a position to provide the required establishment care in the first 10 years after the 2-year tree planting warranty period to enable future healthy tree growth and to prevent early demise of trees, a maintenance regime for all specimen trees at ages 2, 5 and 10 years requires an additional increase in the Urban Forestry operating budget of $1.24 million. A further $0.369 million increase is required to enable adequate maintenance of the increasing number of naturalization planting sites in Toronto as well as to maintain naturally regenerating forest sites throughout the ravines to ensure proper development of these forest areas. These funds will be requested in the 2007 Parks, Forestry and Recreation Operating budget submission and will be referred for consideration during the 2007 budget process.

The Deputy City Manager and Chief Financial Officer has reviewed this report and concurs with the financial impact statement.

Recommendations:

It is recommended that:

(1) the required $0.932 million to reduce the tree service delay which City Council deferred in the 2006 operating budget process be included in the 2007 Parks, Forestry and Recreation Operating budget submission and that this request be referred for consideration to the 2007 operating budget process.

(2) the requirement for an additional $1.24 million in the Urban Forestry operating budget to provide tree establishment care in the first 10 years after the tree planting warranty period of 2 years, as required for future healthy tree growth and to prevent early demise of trees, be included in the 2007 Parks, Forestry and Recreation Operating budget submission and that this request be referred to the 2007 Operating budget process for consideration;

(3) the need for an additional $0.369 million in the Urban Forestry operating budget, to enable adequate maintenance of the increasing number of naturalization planting sites in Toronto as well as to maintain naturally regenerating forest sites throughout the ravines to ensure proper development of these forest areas, be included in the 2007 Parks, Forestry and Recreation Operating budget submission and that this request be referred to the 2007 operating budget process for consideration;

(4) the General Manager, Parks, Forestry and Recreation, in consultation with other City staff, report in time for the 2007 Operating and Capital budget processes on addressing replacement of dead commercial street trees; and

(5) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

Background:

At its meeting of July 25, 26 and 27, 2006, City Council requested the General Manager of Parks, Forestry and Recreation, in consultation with the City's Tree Advocate, to prepare a report for the next Economic Development and Parks Committee meeting, to be held on September 12, 2006, such report to include information on the criteria and follow-up that governs how trees and shrubs are maintained and monitored, to ensure their vitality and growth and that the report include the number of trees and shrubs that have died, the number that have been removed, and the number that have been replaced, and for the same meeting, to report on a plan to audit and evaluate the success of the tree planting program in the City, such audit and evaluation to be completed in 2007.

Comments:

In the 2004 Parks, Forestry and Recreation report "Our Common Grounds", the following facts were noted.

> "… In 1990, the old City of Toronto encompassed 97 square kilometres of land and spent $12.71 per capita per year on forestry. The average Forestry staff person was responsible for maintaining the trees on 0.8 square kilometres. Since amalgamation Parks, Forestry and Recreation cares for trees across an area of 634 square kilometres. The average Forestry staff person is now responsible for the trees in 3.52 square kilometres, more than 4 times greater than before. In 2004, the City's expenditure on Toronto's urban forestry was $6.20 per capita per year. Staff must manage four times the land with half the resources of 1990. This is a recipe for failure. Instead of moving forward we have fallen back.
>
> In the same period, our US competitors, particularly Chicago, invested heavily in green assets. Chicago believes a beautiful, pristine green commons is a spur to economic development, raises property values, and entices tourists. Anyone who has visited Chicago recently can see that its green commitment has changed the whole flavour of the town. Even smaller cities in the US spend more on Urban Forestry than we do.
>
> - Detroit spends $13.00 US per capita
> - Milwaukee spends $15.13 US per capita
> - Minneapolis spends $18.21 US per capita …"

Due to budget increases and staff reallocations in the last two years, Toronto's current operating expenditure in 2006 on Toronto's urban forest is about $8 per capita ($7.2 US). Put differently, the former City of Toronto spent about $91,750/km^2/yr in 1990 dollars (equivalent to about $128,000 in current dollars) while the new City of Toronto currently spends about $31,590/km^2/yr. Current service levels are therefore greatly diminished compared to service levels of most of the former municipalities prior to amalgamation, where during winter months Forestry crews caught up on service requests and also did some proactive tree pruning.

Toronto's funding allocated to tree planting has increased significantly since 2000 through capital programs, but at the same time the demand associated with tree pruning and removal has also substantially increased as a result of drought, pest infestation and frequent storms. Funds for maintenance of new trees have not been added to the Parks, Forestry and Recreation Operating budget since amalgamation. This has further weakened the ability of staff to provide adequate maintenance of existing trees and to adequately maintain newly establishing trees.

To ensure that investments in tree planting are protected and to achieve an increase in canopy coverage from the current 17% to 30-40% cover, existing trees need to be well maintained and newly planted trees need to be maintained regularly in the first 10 years after planting when survival warranties have expired.

Factors that affect planting success

Survival of newly planted trees depends on many factors. The type of stock, whether bare root, potted, or balled and burlapped determines not only the cost of purchase, but also the chances of success. Storage and handling of stock and timing of planting are crucial to success at the outset. The window of opportunity to plant bare root stock is short, lasting only about a month in the spring. A premium is paid to buy and plant stock that has been grown in pots or is "balled and burlapped", but such stock can be planted over a longer season since the roots are protected by some soil.

Other factors that determine planting success include:

- the species and size of trees, as some species transplant well while others such as the highly valued oak trees and some other native species are prone to transplant shock;
- weather conditions at time of planting, and frequency of rainfall during the first season of growth have a tremendous impact on the healthy establishment of new trees;
- soil quality and weed competition on site; and
- proper planting methods, planting depth, mulching and handling of stock.

Some of these factors can be controlled and forestry contractors are monitored to ensure standards of quality are maintained. Volunteers are also provided with instructions on planting to increase tree survival.

In general, for specimen trees, the industry standard for new tree planting survival is 75% accounting for transplant shock and site or weather variables. For naturalization plantings where many more small saplings are planted in close proximity to each other, industry standards are in the 60 to 75% range with total numbers of surviving trees decreasing over time as the trees grow and compete with each other for light, nutrients and water as in natural forest conditions.

Attachment 1 summarizes planting survival by planting type or program. The planting types are described below in terms of their type, described as Street Tree, Park Tree and Natural Area plantings, and by the maintenance activities required to sustain them.

Trees are occasionally planted by staff in the Parks Branch and under contracts that are set up through the Capital Project managers in the Park Development and Infrastructure Management Branch. Trees are also planted on streets under development agreements. Data is not available for inclusion in this report at this time regarding performance of these plantings.

Street Tree Planting

Urban Forestry removes and replaces about 5,500 dead and dying trees per year, mostly in residential areas. Arborist Inspectors identify approximately 6,500 planting locations including the locations where trees have been removed, notify homeowners of the City's intent to replace trees, and conduct utility locates where required prior to planting. Due to limited staff resources, these trees are generally not inspected or maintained in the first ten or more years after planting. Homeowners are given information at the time of planting about watering requirements for the new tree. Residential street tree plantings have not formally been monitored for performance but

random samples in 2006 demonstrate approximately 13% mortality (87% survival). Those that die are replaced in the following planting season. Plans are in place for more thorough monitoring of these plantings this fall and in 2007. If significantly different results are found through that process, staff will report further on this.

In 2005, on a one-time basis, City Planning Division (Urban Design Services) provided $355,000 in capital funds to Urban Forestry for street tree planting, and this was used to plant 813 balled and burlapped trees. Staff conducted 100% assessment of these plantings, which demonstrated very high survival rates of over 90%. All these trees are under warranty and dead trees will be replaced before final release of contract obligations.

Since 2005, Transportation Services has provided $600,000 per year in capital funds to Forestry for street tree planting along roads that have been reconstructed. The funds have been spent to plant approximately 2,050 balled and burlapped trees per year. In 2006, an additional $1,000,000 was provided by Toronto Water, to plant trees in natural areas and along streets to contribute to control of storm water runoff. To date, $600,000 of these funds have been used. A portion has been used to plant more than 1,100 street trees while the rest has been used for naturalization plantings. Prior to planting, Urban Forestry allocates staff to locate planting sites and deliver notices to residential lot owners adjacent to these sites. Following planting, staff monitor tree health and identify deficiencies and adjustments to be done in the first year. After 2 years, the trees must be evaluated and warranties released when appropriate. Staff attempt to conduct 100% assessments of these plantings, and require replacements when trees do not survive the 2 year warranty period. Based on preliminary assessments, survival rates are 85% which is well above industry standards. All trees that are not in good condition over the two year warranty period will be replaced within the original allocated budget.

Park Planting

Urban Forestry plants trees as specimens in parks as part of numerous capital projects including the Tree Advocacy Planting (TAP) Program and Toronto Water Tree Planting and the Commemorative Tree Planting Program. The plantings are often done by contractors, and all of the trees are assessed within the first 2 years of planting. Commemorative trees are mostly planted by Forestry staff as the nature of these requests is sporadic. Plant survival is generally 85%, above industry standard. Forestry staff responds to concerns expressed by the public regarding any problems that occur after planting.

Long term maintenance schedule for street trees and commercial trees

Toronto currently has approximately 484,000 trees on the street tree inventory but we know that commercial and industrial areas have many street trees that are not yet inventoried and are not maintained. The average pruning cycle is 20 years while well established industry standards call for five to seven year pruning cycles. It is well documented that trees should be pruned when they are young to establish good form and remove small dead branches that often arise in the first year after planting. Mulch should be reapplied to planted trees to reduce moisture loss and weed growth and deter damage from lawnmowers or string trimmers. At year 5, branches that are closely spaced should be removed along with twin leaders or large lower branches that will

come into conflict with pedestrians or vehicles. At year 10, the tree is ready for a more substantial formative and structural pruning to correct the form of the tree as required and to avoid future conflicts with hydro or other utility lines and pedestrians and vehicles. Trees that are maintained well when they are small will develop into healthy specimens that will survive longer and provide many benefits to the community.

Industry standards for a proper pruning cycle for young trees would include provision of three services per tree in the first ten years. Maintenance service would be performed in the 2nd year after planting, in the 5th year, and again in the 10th year. It is estimated that the cost to prune a tree in the 2nd and 5th year is about $19.50 each visit. In the 10th year when the tree is larger and the amount of brush to be removed will require a chipper, the cost is about $85 per tree. In total, these three visits to prune a tree while it is still in its formative years will require $124/tree. This is an excellent long term investment as trees contribute a multitude of benefits for the environment and local community but the investment must continue after the original planting to include maintenance. Having had a long term average of approximately 10,000 specimen trees planted each year, the need exists now to prune 30,000 establishing trees annually. The cost to prune 10,000 trees at age two years, 10,000 trees at age five and 10,000 trees at age ten (30,000 trees each year), requires a much needed increase of $1.24 million to the Urban Forestry annual operating budget.

Natural Area Plantings

Natural area plantings are typically done through the Tree Advocacy Planting (TAP) Program as well as other capital programs including the Ravine Management Program and Toronto Water capital funding.

City Council first approved the TAP program for Toronto in 1999. Since inception, most of the plantings are established as natural areas with a mix of trees and shrubs that are intended to form forest-like areas that in the long term require little maintenance and will provide a seed source for further naturalization through natural processes. Trees and shrubs are either planted by volunteer groups in combination with staff, or by contractors.

TAP sites planted by contractors are currently being monitored to assess plant survival, growth and health. Entire planting beds are monitored and all plants counted and checked to ensure that healthy stock and appropriate quantities have been planted. Survival of the plant material is assessed on site and replacement of dead plant material is done as soon as possible. Prior to the end of the two year warranty period, the planting beds are monitored again and replacements are completed by the contractor. Following the warranty period, sites are qualitatively monitored each year for invasive species and maintenance requirements such as thinning, pruning, additional planting, watering, mulching and general clean up.

Volunteer plantings associated with TAP are done by staff working closely with volunteers and community groups. The monitoring protocol for such plantings includes measuring the growth, survival, and general health of the trees at Trees Across Toronto and other volunteer planting sites across the City. A sub-sample of each planting site is surveyed in a randomized 10 x 10 m plot design and extrapolated statistically to attain survival rates for the entire planting site.

Monitoring will be conducted every two years initially until the plantings have become established. After this time, monitoring is scheduled to continue every 5 years. This method of data collection provides short-term species success rates and also allows long term monitoring of forest development by tracking tree stem basal area over time.

In addition to the TAP program, trees have been planted by the Ravine Management Program and Natural Environment and Community Program in natural areas through other Capital funding sources. Some of these projects have included the City Wide Environmental Initiatives capital budget, the High Park Significant Oak Woodlands Restoration budget, Milne Hollow slope and wetland plantings and other projects. Such plantings are done with smaller planting stock, and require a longer period of watering and weed control to enable their establishment to a condition termed as “free to grow”. This condition is attained when trees grow above the weeds and have well established root systems more capable of withstanding extended periods of drought.

A higher attrition rate is accepted for trees that are planted in natural areas, given the stock is usually sapling size, planted very close together, less expensive, and the factors affecting survival are more dynamic. For naturalization plantings, industry standards are in the 60 to 75% range for survival with total numbers of surviving trees decreasing over time as the trees grow and compete with each other for light, nutrients and water as in natural forest conditions. Plantings done through the Ravine Management Program are monitored using a complete count method to determine planting survival at each site. Despite difficult growing conditions, Urban Forestry continues to experience success rates above industry standards at all natural area planting locations.

Long term maintenance schedule for natural areas

Trees planted in natural groupings do not require the intensive pruning of street trees since the natural competition and close proximity of trees and shrubs to each other promotes natural self pruning or tree mortality as the canopy closes over the site. It is important to establish the canopy cover quickly after planting, to prevent weed competition. As such, fast growing trees such as poplar may be planted alongside slower growing trees such as oak. It is important however to return to the site to prune and remove some of the fast growing trees so that they do not overtake the site, and smother the slower growing trees. Ideally the final composition of a site will include a greater number of long-lived, slower growing trees, and fewer short-lived, fast growing ones.

Currently, Urban Forestry is employing nine seasonal field staff to maintain natural area planting sites. With increased number of plantings, there is a need to hire additional staff. The current cost of operating a three person field crew for nine months is approximately $123,000. A Natural Resource Specialist provides direction to these crews, developing work plans, advising Councillors and Park Supervisors of work to be done when it involves larger tree removal or pesticide application to control weed infestations, reviewing technical data to determine best practices and assessing monitoring results to inform future work plans.

An additional three crews are required to adequately maintain the increasing number of naturalization planting sites in Toronto as well as to maintain naturally regenerating forest sites through the ravines to ensure proper development of these forest areas. An increase of $369,000 to the forestry annual operating budget is required for this to be possible.

Watering

Available resources are currently concentrated on those trees that are less likely to be watered by members of the public, and locations where trees are under the greatest water stress. This includes trees planted in the sidewalks in the downtown core and trees planted in parks where irrigation does not exist. City Council authorized an increase to the Parks, Forestry and Recreation Operating budget in 2004 of $200,000 to develop this small but much needed tree watering program. An additional $110,000 in Capital funding associated with another $190,000 for commercial street tree replacements is being used in 2006 to augment the tree watering program. The combined funding provides for 5 tree watering crews during the growing season. The additional funds of $1.24 million previously referred to in this report for specimen tree establishment would provide some ability to reallocate the same staff and equipment used for young tree establishment to watering of trees during drought periods.

Watering of trees in the downtown core is done at night when reduced traffic and volume of parked vehicles permit better access and efficiency of the operation. Both newly planted and older trees are watered. In parks, newly planted trees are watered for the first 2 years after planting.

Forestry promotes the importance of watering residential tree plantings to the public through the "Soak-it to me" campaign, door hangers provided to residents at the time of planting, Toronto Star advertising as Tree Advocacy sponsorship and participation of media in getting the message out especially during periods of drought.

Street trees planted with capital funds such as Transportation and Toronto Water funding as well as other programs are watered by contractors within the first two years of warranty. Following the warranty period, any additional watering is done by Forestry staff.

TAP and Toronto Water natural area plantings are currently watered by contractors bi-weekly throughout the first growing season and monthly during the second growing season. During periods of extreme drought, additional watering is contracted out.

The Ravine Management and Natural Environment & Community Programs sections have maintained planting sites over the past six years by watering sites through a combination of contracted staff, volunteers and natural resource crews. The majority of the planting sites are on ravine slopes or riparian areas that are not accessible with a conventional watering truck. Staff and volunteers have utilized a combination of watering tools including parks watering systems, fire hydrants and pumping water from local water sources where appropriate. The planting sites have been watered on a bi-weekly basis throughout the first growing season or as required dependent on weather conditions.

A plan for a more intensive audit of tree planting success

City Council requested that Urban Forestry report on a plan for an audit of the City's tree planting programs to determine rates of planting success. As detailed in this report, contracted plantings are currently being audited closely, but in-house residential street tree plantings are monitored less formally. However, informal review of residential plantings has indicated a survival rate of approximately 87% which is higher than industry standards of 75%. If further formal review that is scheduled to be done in fall of 2006 and 2007 indicates rates significantly different, Urban Forestry will report further in 2007.

Given the large numbers and scattered distribution of the residential and park tree plantings, it is proposed that a more formal audit be conducted on a sample of the total number of planted trees. A five percent sample of residential street tree planting in 3 years would result in 230-303 trees being evaluated for each of 3 years. The evaluation would be done by expert foresters or arborists over a period of about 21 days in the summer of 2007. The cost of completing this audit is projected to be $8,555 and will be accomplished within the existing operating budget.

As stated in this report, specimen calliper trees planted within the capital funding programs of TAP, Transportation Services, Toronto Water and Urban Design, and the Asian long-horned beetle tree replacement program are all being inventoried. Approximately 73 person days per visit is required to accomplish monitoring/inventory of these sites. Two visits are required, one in the first year of the contract, and the second at the end of the warranty period. The annual time commitment to complete such inspections is therefore about 146 person days and costs approximately $32,000/year. Seasonal labour is hired to help complete these inspections, and is charged to the Capital programme budgets as part of the cost associated with tree planting.

Conclusions:

The data to support evaluation of tree survival is not entirely complete, although programs which have been quantitatively sampled show that success is higher than industry standards. Urban Forestry requires that contractors replace trees that die in the first two years after planting, which theoretically brings the success rates to 100% over time. In volunteer plantings, survival rates are typically qualitatively reviewed rather than through actual counting of dead trees. A method of quadrat sampling similar to the TAP natural area plantings was initiated in 2005 and will provide data in future years. A plan to sample in-house planting programs is proposed within this report and will be conducted in 2006/7. Should the data identify that survival results are significantly lower than those noted in this report, Urban Forestry will report on this further.

It is clear that with a tree service delay of 12 months, and with a current 20 year pruning cycle, where there is no new tree establishment care other than watering given to new trees, that Urban Forestry is not achieving the quality of maintenance services that would best support healthy trees and urban forest maintenance standards that residents are proud of. Additional funds are required to improve the maintenance, both in reducing tree service delays and in improving long

term tree health by implementing a program of young tree establishment maintenance that supports healthier tree growth and reduced long term maintenance costs.

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List of Attachments:

Attachment 1.- Tree Planting Programs 2000-2006 - Survival and Replacement Rates

ATTACHMENT 1
URBAN FORESTRY
TREE PLANTING PROGRAMS 2000-2006 - SURVIVAL AND REPLACEMENT RATES

PROGRAM	PERIOD	AVERAGE NUMBER PLANTED PER YEAR	PLANTING SURVIVAL	REPLACEMENT
Forestry District Residential and Commercial Tree Planting	2000-2006	7500	The industry standard for street tree planting survival is 75%. Based on preliminary assessments average planting survival is 87%, a more detailed audit using random sampling will be conducted 2006/7	All newly planted trees that die are replaced within one year. Approximately 50% are even replaced within six months; many species can only be planted in the spring
Urban Design Street Tree Planting - One Time Funding Only*	2005	815	The industry standard for street tree planting survival is 75%. Based on an assessment of all planted trees, the average planting survival is 90%, trees are still under warranty and will be replaced to achieve 100% survival	All dead trees are replaced within the warranty period
Toronto Water - Street Tree Planting Component* (Based on mid-year spending)	2006	1100*	Planting is still ongoing and data on planting survival is not yet available	All dead trees are replaced within the warranty period
Transportation Services Street Tree Planting	2005-2006	2050	planting survival is 75%. Based on an assessment of all trees planted in 2005, the average planting survival is 86%, trees are still under warranty and will be replaced to achieve 100% survival, 2006 planting is still ongoing and data on survival is not yet available	All dead trees are replaced within the warranty period
ALHB Street Tree Planting (Northwest area of City)	2004-2006	500	On average planting survival is 80%, trees planted in 2005 suffered heavy mortality due to severe winter conditions, but are currently being replaced to achieve 100% survival	All dead trees are replaced within the warranty period
Park Specimen Tree Planting through various programs	2000-2006	600	On average planting survival is 85%, trees that are still under warranty will be replaced to achieve 100% survival	All dead trees are replaced within the warranty period

ATTACHMENT 1
URBAN FORESTRY
TREE PLANTING PROGRAMS 2000-2006 - SURVIVAL AND REPLACEMENT RATES

Tree Advocacy Planting Program (includes trees, shrubs and herbaceous plant material)	2000-2006	48,250	The industry standard for survival ranges between 60 and 75%. On average planting survival for TAP sites ranges between 70-80%, depending on site location (sites along transportation corridors and sites with heavy competition from weeds and invasive species experience heavier mortality than sites planted in parks or ravines). Quantitative assessments are available for 2004-2006 plantings and quantitative assessments of 2000-2003 plantings are currently being conducted	For naturalization plantings where many more small saplings are planted in close proximity to each other, industry standards for survival range between 60 and 75%. The total number of surviving plant material decreases over time as the trees grow and compete with each other for light, nutrients and water as in natural forest conditions. Forestry naturalization plantings have a higher survival rate than industry standards, however maintenance of sites including weeding is critical to ensure ongoing success
Other Naturalization Plantings including Toronto Water (Naturalization Planting Component for 2006 Only*), Ravine Management and Other Programs (includes trees, shrubs and herbaceous plant material)	2000-2006	16,550	The industry standard for survival ranges between 60 and 75%. On average planting survival for naturalization plantings ranges between 70-80%, depending on site location (sites that experience heavy competition from weeds and invasive species suffer higher mortality). Quantitative assessments are available for 2004-2006 plantings and quantitative assessments of 2000-2003 plantings are currently being conducted	For naturalization plantings where many more small saplings are planted in close proximity to each other, industry standards for survival range between 60 and 75%. The total number of surviving plant material decreases over time as the trees grow and compete with each other for light, nutrients and water as in natural forest conditions. Forestry naturalization plantings have a higher survival rate than industry standards, however maintenance of sites including weeding is critical to ensure ongoing success
Total Number of Street Trees Planted Since 2000	**64215**			
Total Numbers Planted within Naturalization Plantings Since 2000 (includes trees, shrubs and herbaceous plant material)	**460200**			