TORONTO TRANSIT COMMISSION
REPORT NO.

MEETING DATE: November 17, 2009

SUBJECT: YONGE-UNIVERSITY SPADINA LINE – SUBWAY RAIL YARD NEEDS STRATEGY

ACTION ITEM

RECOMMENDATION

It is recommended that the Commission:

(1) Approve the Subway Rail Yard Needs Strategy (SRYNS) to provide sufficient yard capacity to 2030 (based on Option 2A) for the Yonge-University-Spadina (YUS) line noting that functional planning/scope definition to implement the strategy is currently underway and will be reflected in the future TTC Capital Program;

(2) Forward this report to Metrolinx and York Region for their information noting that the full implementation of the SRYNS will impact the TTC Capital Budget and the budget for the Yonge Subway Northern Extension project;

(3) Authorize staff to take the necessary steps to identify a suitable property that could be purchased within the next 10 years to protect for the design and construction of a future storage and maintenance yard on the Yonge Subway side of the YUS line in order to protect the long term/strategic rail yard needs of the TTC beyond 2030 and approve, in principle, the inclusion of funds in the outlying years of the 2011-2020 Capital Program for the purchase of a new yard on the Yonge Subway side of the YUS line to provide staff with the flexibility to purchase a suitable property should one become available for sale; and

(4) Endorse staff's inclusion of a subway rail yard needs analysis for the Bloor-Danforth Subway line to identify long term yard requirements to 2030 and beyond as part of the 2011-2015 Capital Program.

FUNDING

The Subway Rail Yard Needs Strategy (SRYNS) for the YUS line was funded by York Region in recognition of the urgency to identify a strategy to store/maintain subway vehicles resulting from the extension of the Yonge Subway to Richmond Hill and other planned growth in the YUS subway car fleet.

The cost implications of implementing the SRYNS (property, carhouse and yard capital improvements) are currently being analyzed and will be reflected in the future TTC Capital Program, the existing budget for the TYSSE (Toronto-York Spadina Subway Extension) project, and the future budget for the Yonge Subway Extension project as appropriate.

BACKGROUND

(a) Ridership Growth Pressure

The YUS line is expected to experience significant ridership growth to 2031 reflecting the ridership generated by a variety of growth pressures as follows:

- The proposed extension of the Yonge Subway to Richmond Hill Centre,
- The implementation of the Transit City initiatives, and
- General population growth both within and outside the City of Toronto.

The ridership growth on the YUS line expected to 2030 will lead to growth in the YUS subway car fleet over time as trains are added in response to demand. The growth in the subway vehicle fleet must be matched by subway storage and maintenance capacity at various TTC subway maintenance facilities.

(b) Future YUS Subway Rail Yard Needs to 2030

Given the above pressures, the purpose of the SRYNS was to evaluate the long term (20 year) yard, maintenance and storage requirements to accommodate the projected growth in the subway car fleet for the YUS line to 2030. The specific objectives of the study included the following:

- Identification of existing yard capacity and maintenance/operational constraints;
- Evaluation of alternative locations for future yard and general maintenance facility requirements;
- Preparation of a definition of general maintenance facility requirements to support the fleet/operational requirements to 2030; and
- Development of a rail yards strategy to accommodate the subway vehicle fleet to 2030 and the identification of recommended next steps.

The SRYNS study also responds to a City of Toronto Council motion (January 27/28, 2009) as follows:

> "City Council direct the City Manager and Chief General Manager of the TTC to commence discussions with Metrolinx, the Province of Ontario, York Region and Government of Canada for the purposes of securing the appropriate funding and service agreements on the basis of the following requirements:
>
> - The Subway Rail Yard Needs Strategy to support the Yonge Subway Extension and service increases on the Yonge-University-Spadina (YUS) subway, being conducted by the TTC, may identify location options in York Region and may provide for further funding needs beyond those currently reflected in the preliminary budget."

The SRYNS was focused on the locational analysis of strategic yard options for the YUS line only and was not intended to determine the scope and functional requirements of a specific YUS yard configuration or YUS yard layout.

As the SRYNS was limited to the accommodation of the YUS fleet requirements, it did not include consideration of the vehicle fleet growth/yard requirements that may occur on the Bloor-Danforth Subway line. As well, while the SRYNS was based on the assumption that the T-1 fleet currently located at Davisville/Wilson Yard would be relocated to Greenwood Yard (resulting in the YUS fleet being 100% Toronto Rocket cars) the specific implications of the T-1 fleet displacement to Greenwood Yard were not a focus of the SRYNS study.

The analysis of specific yard functional requirements/layouts, based in part on the SRYNS, is currently underway as part of the development of a rail amalgamation study.

(c) Rail Amalgamation Study

In order to implement the SRYNS and the related impacts on Wilson Yard, Davisville Yard, Greenwood Yard, Vincent Yard (Keele), Harvey Shops, and other TTC industrial functions, a Rail Amalgamation Study is currently being developed consistent with the SRYNS. This will include consideration of the displacement of the T-1 fleet to Greenwood Yard in order to consolidate the Toronto Rocket (TR) fleet on the YUS line. The Rail Amalgamation Study for capital improvements to yards, carhouses, and industrial facilities is underway and will be reflected in the future TTC Capital Program.

The development of a Subway Rail Yard Needs Strategy for the Bloor-Danforth (BD) subway line, over and above the Greenwood Yard implications resulting from the displacement of the T-1 subway car fleet to the BD line, will require a separate study to determine strategic yard options to accommodate projected fleet growth to 2030 and beyond.

(d) Operational Assumptions for SRYNS

The SRYNS assumed the following growth in the YUS subway car fleet to 2030;

- The YUS line will utilize all TR cars;
- All T-1 subway cars will be re-located to Greenwood Yard;
- With the above, the Sheppard Subway fleet would be maintained at Greenwood Yard;
- Full Automatic Train Operation (ATO) on the YUS line will be available no later than 2017;
- The fleet implications of a possible 7 car subway train is beyond the time horizon of the study;
- On line storage of trains overnight is only practical on an exception only basis and is not operationally sustainable as a regular practice;
- Overnight storage of trains at terminal stations is operationally acceptable; and

- Davisville Yard is only suitable for storage and light maintenance/cleaning (not heavy overhauls).

(e) YUS Subway Car Fleet Growth

The SRYNS assumed the following growth in the YUS subway car fleet to 2030.

- The current YUS subway car fleet is 62 trains consisting of 48 revenue trains, 14 maintenance spares (372 vehicles); and
- By 2030 the YUS fleet is projected to grow to 80 revenue service trains, 8 maintenance spares for a total of 88 trains (528 vehicles). Currently, the Rail Amalgamation Study is proceeding based on the need for the total number of trains in 2030 consistent with the SRYNS assumptions.

The projected growth in the YUS fleet takes into account the following initiatives:

- Extension of the St. Clair West short turn to Glencairn;
- The introduction of ATO/ATC and the operation of 1 minute 45 second headways within the time horizon of the study (2030);
- The Spadina Subway Extension to Vaughan Corporate Centre Station; and
- The Yonge Subway Extension to Richmond Hill Centre Station.

(f) Current Yard Capacity

The current capacity of Wilson/Davisville Yard (for storage of trains only, i.e. not taking into account carhouse capacity for maintenance/overhaul) is 358-370 vehicles leaving a shortfall in yard capacity of 158-170 vehicles to 2030. While the Yonge and Spadina Subway projects will be responsible for funding and implementing the respective yard facilities for the fleet for each extension, the remaining capacity deficit for storage (and industrial facility and carhouse capacity) will be funded in separate capital budget envelopes as determined by the Rail Amalgamation Study currently being developed.

(g) Current Operational Constraints at YUS Yards

The existing Wilson Yard and Davisville Yard/Carhouse facilities have unique operational constraints which affect existing operations and which constrain how the yards can be expanded to accommodate future growth.

Wilson Yard has the following operational constraints:

- The yard only has a single hostlers platform for the dispatch of trains into/out of revenue service. As the capacity of the yard increases, there will be a need for a second hostlers platform to dispatch trains to the mainline;
- Operational staff who shunt the trains from the carhouse to the hostlers platform must walk through the yards to pick up trains;
- Revenue vehicles can only effectively be fed southbound on the Spadina Subway line. This is a major constraint to existing yard operations and a

northern connection from Wilson Yard to the mainline is needed (this connection is included in the scope of the TYSSE project);

- The ability of the existing yard to feed additional YUS trains is constrained;
- Revenue and non-revenue trains conflicts are routine especially in the AM service build up period when non-revenue trains are being returned to the yard and revenue trains are being dispatched to the mainline to build up service;
- The yard relies heavily on the need to turn back trains to move trains within the yard as opposed to the "through" movement of trains in a continuous direction;
- Even with the expansion of the carhouse to house the Toronto Rocket fleet, Wilson Carhouse does not have sufficient capacity for the long term. The existing capacity of Wilson Carhouse for subway car maintenance of 6 car TR trains relative to the ultimate capacity required to accommodate the conclusions of the SRYNS will be determined as part of the Rail Amalgamation Study currently underway;
- The track storage capacity for trains must be increased within Wilson Yard as the fleet grows; and
- The location of Wilson Yard on the less utilized Spadina Subway line for the majority of the YUS fleet results in higher deadhead mileage costs, which is reflected in the operating costs of the line. As YUS infrastructure ages (and requires more maintenance) the constraints of deadheading trains from Wilson Yard to the rest of the YUS line and the constraints of the nightly maintenance window will be increasingly apparent. In addition to Wilson Yard expansion having some degree of EA approval, the current modifications to the carhouse (to accommodate 6 car TR train consists) results in Wilson Yard being a desirable expansion option for TR trains (particularly in comparison to expansion of Davisville Yard).

One of the advantages of Wilson Yard is that expansion is possible given the purchase of property to the north of the existing yard, the yard is not currently in close proximity to sensitive uses (particularly residential uses) and an EA for expansion of Wilson Yard is already in place.

For Davisville Yard, the following operational considerations are currently apparent:

- The existing yard/carhouse is designed for 2 car married pairs not 6 car Toronto Rocket train consists;
- It relies on turn back operations to operate the yard;
- With the Toronto Rocket fleet at Davisville Yard, the number of cars that can be stored/cleaned overnight will be reduced compared to the present capacity due to the 2 car consist track layout;
- The yard is well situated to supply trains to the YUS line but is surrounded by high density residential uses that are sensitive to yard operations;
- It is not considered practical or cost effective to expand Davisville Yard given property constraints. Davisville Yard is constrained by existing apartment

buildings to the south and west, the park to the north west, and the existing carhouse/YUS mainline to the north and east. It is not considered practical to extend the existing track arrangement to accommodate 6 car TR train consists or to expand the capacity of the yard in a significant way by acquiring additional property. The displacement of existing yard functions to the west of the existing Carhouse to accommodate additional storage capacity for 6 car trains is also not operationally desirable and is not recommended. As a result, expansion of Davisville Yard was not considered a viable yard expansion strategy.

- With the Toronto Rocket fleet (6 car train consists) and assuming no expansion of Davisville Yard, there will be storage tracks (which are designed for 2 car married pairs) that may be available for other yard functions. The consolidation of the majority of the maintenance/storage of the non-revenue vehicle fleet at Davisville Yard to take advantage of the unused portion of the yard (post Toronto Rocket fleet implementation) was therefore considered a base case for all future strategic yard operations analyzed in the SRYNS.

Given the above constraints and operational considerations, the SRYNS focused on the following yard expansion options:

- Expansion of Wilson Yard/Carhouse to the north on property already purchased for this purpose;
- Consideration of the operational benefits of extending the Sheppard Subway from Yonge to Downsview to allow Yonge Subway trains to be fed directly from an expanded Wilson Yard;
- Due to the potential to expand Wilson Yard no consideration was given to the creation of a new yard on the Spadina Subway line to accommodate future growth. The operation of two yard/carhouse facilities on the Spadina line (i.e. Wilson Yard and a new yard on the Spadina line) which would require the acquisition of a new yard property) was not considered a viable option due to the current property owned by the City/TTC north of the existing Wilson Yard and the duplicate staffing costs of two separate yard facilities located in close proximity to each other.
- No expansion of Davisville Yard but changes in the functional use of the yard to be considered;
- The construction of a new yard/carhouse on the Yonge Subway line; and
- The construction, as part of the Yonge Subway North Extension project, of an extended tailtrack for overnight storage/cleaning of subway cars.

DISCUSSION

(a) Analysis of Strategic Yard Operations

Five options were developed to analyze future yard options for the YUS line. Each option was analyzed in terms of the following key factors:

- Estimated yard capital costs (excluding vehicles);
- A property cost allowance was included in the capital cost to implement each generic yard option;
- Estimated operating costs including administration/staffing of carhouses and deadhead mileage costs;
- The deadhead mileage analysis was based on generic yard locations/configurations;
- A net present value (NPV) analysis of capital, annual deadhead and annual facility costs was calculated. It should be emphasized that the specific location of a new Yonge Subway Yard/Carhouse was not considered critical to the deadhead mileage analysis for each strategic yard option. The NPV analysis was therefore based on a generic location of a yard in the Yonge Subway corridor rather than the capital/property costs of specific property and yard location; and
- Following the NPV analysis, a review of the specific land availability to implement those options required additional property was undertaken.

In all five yard expansion options considered in the SRYNS, Davisville Yard was utilized for the storage/maintenance of the majority of the YUS/Bloor-Danforth non-revenue fleet. With the above common aspect, the five yard expansion options are outlined in detail in Table 1.

The five options are summarized as follows:

Option	Description
1	Limited Wilson Yard Expansion
2	Full Wilson Yard Expansion
2A	Full Wilson Yard Expansion/Continued use of Davisville Yard for Limited Revenue Service Trains
3	New Yonge Storage and Maintenance Yard
4	New Yonge Storage Yard
5	Same as Option 2 plus Sheppard Subway (Yonge – Downsview)

With the exception of Options 1 and 2A, the revenue service trains currently stored/cleaned at Davisville Yard are displaced to other locations to facilitate the consolidation of storage/maintenance of the non-revenue fleet at Davisville Yard. With Options 1 and 2A, 6-8 revenue service trains would continue to be stored/cleaned at Davisville Yard in addition to the non-revenue trains that can be accommodated in the remainder of the yard.

The resulting storage, washing and heavy maintenance capacity of each of the existing and proposed yard facilities is outlined in Table 2. Option 1 does not meet the capacity requirements for storage, washing and heavy maintenance of the projected 88 train capacity requirement to 2031. It was included to demonstrate the fact that the expansion of the Wilson Carhouse/storage tracks to support the Toronto Rocket fleet will not provide sufficient capacity to accommodate the future fleet YUS subway cars that will operate on the YUS line to 2030 and that additional yard facilities must be designed/constructed as the fleet grows. As a result, Option 1 was dropped from further consideration and only the NPV analysis for the remaining four options (which provide sufficient capacity to 2030) are presented below.

(b) NPV Analysis

Table 3 outlines the operating, capital, and NPV costs of Options 2, 3, 4 and 5. The costs and advantages and disadvantages of each option are discussed below. As noted previously, the NPV analysis included an allowance for the purchase of a generic property to accommodate each expansion option rather than a specific property acquisition cost for each individual option.

Option 2 – Full Wilson Yard Expansion

Option 2 capitalizes on the availability of existing TTC/City property north of the existing Wilson Yard and 1992 EA approvals for yard expansion and expands Wilson Yard as the primary site for the YUS fleet to 2030. It maximizes the use of existing yard assets and therefore has the lowest implementation risk of all options. Option 2 also has the lowest NPV of all options considered. The inclusion of 14 train storage capacity on the Yonge Subway Extension as part of this option (to store the 10 trains required for the Yonge Extension and the four train storage capacity displaced from Finch) provides operational flexibility on the Yonge side of the YUS subway line. The consolidation of heavy maintenance functions at Wilson Yard and the non-revenue fleet at Davisville Yard provides some economies of scale from a supervision/administrative perspective.

Option 2A – Full Wilson Yard Expansion/Limited Use of Davisville Yard

While Option 2 was initially conceived in the SRYNS as having no storage/cleaning of revenue service trains at the existing Davisville Yard, subsequently a further option was developed to include the storage/cleaning of 6-8 revenue service trains at Davisville Yard in combination with the storage/cleaning of the majority of the non-revenue fleet at Davisville (Option 2A). Although, utilizing 6-8 revenue trains at Davisville Yard was not analyzed from an NPV perspective in the SRYNS study, it is expected that the NPV of Option 2 would be reduced with 6-8 trains stored at Davisville Yard (Option 2A) from the estimate in the SRYNS due to a small reduction in deadhead mileage costs.

Option 3 - New Yonge Subway Storage and Maintenance Yard

Due to the creation of a new YUS yard site, this option has higher capital costs, slightly lower deadhead mileage costs, higher building operations costs and the NPV of all costs

is 8.4% higher in Option 3 than in Option 2. The construction of a new storage/maintenance facility on the Yonge line will be an environmental, political and risk challenge given the built up nature of the existing Yonge Subway corridor and along the proposed extension to Richmond Hill Centre Station.

Overall, the feasibility of obtaining a new yard property (and the necessary environmental approvals) is highly risky affecting the cost, schedule, and implementation certainty in comparison to expansion of Wilson Yard in Option 2.

Option 4 - New Yonge Storage Yard

The creation of a new Yonge storage/cleaning facility on the Yonge line (with the remaining storage and heavy maintenance of the fleet at Wilson Yard) makes better use of Wilson Yard assets than Option 3, but the higher capital costs of this option are not offset by lower operating costs. As this option has similar implementation risks as Option 3, at a higher overall cost, it is difficult to rationalize the cost effectiveness of this option in comparison to Options 2 or 3. With Option 4, the Richmond Hill Centre (RHC) tailtrack (14 trains) storage would revert to a terminal station tailtrack configuration (4 trains in total, 3 trains stored in the tailtrack, one train at the terminal station platform). While this eliminates the need to acquire property in the Richmond Hill/Langstaff designated growth centre for an extended tailtrack, this advantage is not enough to overcome the higher overall costs/risks of the implementation of Option 4.

Option 5 – Sheppard Subway Connection to Wilson Yard/Wilson Yard Expansion

A Sheppard Subway connection to/from Wilson Yard (in combination with expansion of Wilson Yard and the RHC extended tailtrack for 14 trains) results in lower deadhead mileage and building operations costs. However, the savings in operating costs over the 2010 – 2030 period ($8 to $11 million over the 20 year period) is small in comparison to the NPV of additional capital costs for the Sheppard Subway connection (Downsview to Yonge). While the Sheppard Subway connection is an important network and strategic connection in the long term and would provide operational flexibility to feed the Yonge Subway directly from Wilson Yard, it cannot be justified from an NPV or yard perspective and as a result, Option 5 is not cost effective.

(c) SRYNS Conclusions

Overall, Option 2A (modified to include the storage of 6-8 revenue service trains at Davisville Yard) is the preferred option for the following reasons:

- It has the lowest NPV of all options considered;
- Minimizes deadhead mileage costs compared to concentrating revenue service trains at Wilson Yard, For example, Option 2A reduces deadhead mileage costs by $300,000 - $400,000 per year compared to the Option 2A concentration of yard capacity;
- It minimizes the impact on the nightly maintenance window compared to Option 2;

- It has the least social/environmental impact of all options;
- It has low implementation risks due to existing property/1992 EA approval for expansion of Wilson Yard;
- Creates economies of scale at Wilson Yard from a staffing/administrative perspective;
- Maintains limited revenue service trains at Davisville Yard but allows consolidation of the majority of the non-revenue fleet at a single location (Davisville);
- Requires no purchase of stand alone yard property; and
- Provides a better balance of yard capacity on the Yonge and Spadina Subway lines.

Given the above, Option 2A is the recommended strategy from a financial perspective for accommodating the projected growth in the YUS fleet to 2030.

It should be recognized that a preliminary search of the availability of property to implement Options 3 and 4 was problematic.

Following the NPV analysis, a preliminary search was undertaken for vacant property within 2 kilometres of the existing Yonge Subway (or the proposed Yonge Subway extension) to implement a new Yonge Subway yard in Options 3 and 4 to satisfy yard requirements to 2030. To implement Option 3 requires a 10 hectare (25 acre) parcel of land while Option 4 requires a 4 hectare parcel (10 acres). With the search criteria limited to vacant land (i.e. little or no existing buildings) the search results were very poor for yards of the required size and configuration.

Finding a suitable property in the Yonge Subway corridor to satisfy the property requirements to 2030 will likely require the purchase of an industrial property. This would involve displacing the existing industrial use/employment and constructing a yard in an industrial/employment district where the surrounding land uses would be compatible with yard operations on a 24/7 basis.

It is likely that the construction of a 14 train storage/daily cleaning facility north of Richmond Hill Centre (as outlined in Option 2/2A) to house the additional fleet for the Yonge Subway extension will require the purchase of property. Exhibit 1 outlines the layout of the Richmond Hill Centre extended tailtrack assuming a 14 train capacity. However, this facility, to be constructed as part of the Yonge Subway extension project, is expected to be entirely underground and will attempt to maximize the use of existing public lands owned by York Region and/or GO Transit (Richmond Hill GO corridor). As a result, the implementation risks related to the implementation of the 14 train Richmond Hill Centre tailtrack in Options 2/2A and 5 is considered to be low to medium risk.

(d) Long Term Strategic TTC Risks for Yard Expansion

While the implementation risks of proceeding with Option 2A to serve the YUS line appear to be manageable to 2030, the long term strategic needs of the TTC from a subway rail yard perspective beyond 2030 (YUS and Bloor-Danforth lines) is not without risk. The purchase of the Wilson Yard property north of the existing yard in the mid 1990's was forward thinking and has turned out to be strategically important to the TTC. Similarly, the TTC has purchased property (in advance of service requirements) for future bus garages and again such purchases have served to protect the TTC interests for the expansion of the bus fleet.

As it can take 8-10 years to search for a subway yard site, purchase a property, obtain EA approval, and design and construct a new subway yard facility, the purchase of land to protect for subway rail yard needs beyond 2030 is vitally important to the TTC's operational interests. Furthermore, locating subway yards in the future is even more problematic than protection for expansion of bus maintenance/storage capacity by comparison. The challenges with respect to the future purchase, design and construction of subway rail yards is extremely challenging as follows:

- Severe limitations due to the cost of constructing connections to the mainline, in terms of the proximity of yards to existing/proposed subway lines;
- Stringent environmental requirements for new rail yards;
- Mitigation of environmental concerns can be complex and costly;
- High implementation risks particularly in finding a suitable property;
- Depending on the location, significant public opposition to proposed subway rail yards can be expected;
- Due to the built up nature and on-going demand for intensification in existing/proposed subway corridors, the potential sites for subway yards are severely limited;
- High land acquisition costs which can only escalate as intensification takes place in existing and future subway corridors; and
- Subway yards, to operate efficiently, have an optimal configuration which may require assembly of multiple properties.

Given the above challenges, the TTC has two main medium to long term yard requirements that must be protected for:

- YUS yard requirements beyond 2030 that are beyond the scope of the SRYNS/Rail Amalgamation Study;
- The yard requirements for the BD line beyond the consolidation of the T-1 fleet at Greenwood Yard.

YUS Yard Needs Beyond 2030

The SRYNS/Rail Amalgamation Study will address YUS fleet growth to 2030. However, beyond 2030, the YUS fleet could grow beyond the capacity that was assumed in the SRYNS /Rail Amalgamation Study including the following growth pressures that are not reflected in the SRYNS:

- The addition of a seventh car to existing train consists (or longer 6 car trains);
- The reduction in YUS headways below 105 seconds; and
- Extension of the assumed short turn location on the Spadina Subway line beyond Glencairn.

From a vehicle fleet perspective, the addition of almost 90 additional 50ft cars (to operate 7 car trains) and/or a 15% reduction in headways (from 105 seconds to 90 seconds) which would increase the YUS fleet by 14% would trigger the need for a new yard on the YUS line over and above the 2030 yard capacity to implement Option 2A.

Given the existing challenges to locating suitable subway yards and recognizing that such challenges will be even more difficult in the YUS corridor in the future, the TTC must be prepared to strategically purchase suitable future subway rail yard properties on the YUS line now to protect for future yard needs beyond 2030. This would involve the purchase of a property now that would be held to accommodate long term YUS subway yard needs beyond 2030 and could include the lease back of the property to the existing property owner pending implementation of subway yard facilities in the future. Such property assets, if purchased in the next 10 years and held for the future, will likely appreciate in value and therefore purchasing a future yard property now represents a low financial risk for the TTC/City of Toronto.

From a capital budget perspective, this would involve creating a budget envelope in the outlying years of the 2015-2019 capital budget for the purchase of property to protect for YUS subway rail yard needs beyond 2030. This would provide staff the flexibility to acquire a YUS yard property should a suitable property become available on the market.

Bloor-Danforth Subway Rail Yard Needs

With the conversion of Greenwood Yard to accommodate the T-1 fleet (and the displacement of the majority of the non-revenue fleet to Davisville) Greenwood Yard will have only limited capacity to accommodate the potential growth in the BD/Sheppard fleet.

The TTC's strategic rail yard needs for the Bloor-Danforth line have not been analyzed in some time. Given the TTC's release of the Westwood Theatre lands as a subway yard for the Bloor-Danforth line and the poor feasibility of expanding Greenwood Yard, the TTC has little or no ability from a yard/carhouse perspective to respond to growth in Bloor-Danforth fleet size in the medium to long term.

The following potential long term growth in the BD fleet needs to be addressed from a yard/carhouse perspective:

- Reduction in BD headways to 2 minutes, 10 seconds; and
- The implementation of ATO/ATC on the BD line and the resulting fleet growth resulting from 105 second headways.

The vehicle fleet implications of either of the above operating scenarios would exceed the capacity of Greenwood Yard to varying degrees.

With the above potential growth in mind, it is important that the TTC develop a subway rail yard needs strategy for the Bloor-Danforth subway line to identify long term needs and property options and to protect for YUS subway yard needs beyond 2030.

JUSTIFICATION

The approval of the Subway Rail Yard Needs Strategy for the YUS line to 2030 will allow a Rail Amalgamation Study to be developed to influence the future TTC Capital Program for yard facilities and the 2015-2019 capital budget for acquisition of future yard property for the YUS/BD lines.

An analysis of long term BD yard requirements is needed to protect for the future and the strategic purchase of property for future yard requirement on the YUS/BD lines maybe required in the next 5-10 years.

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Attachments: Table 1
Exhibit 1
Table 2
Table 3

Table 1 – Yard Expansion Options

Option	Description	Scope of Expansion	Meets Long Term Capacity Requirements	Property Requirements
1	Limited Wilson Yard Expansion	– Completion of TR Carhouse expansion at Wilson Yard – Limited use of Davisville Yard for revenue trains – Extended RHC Centre tailtrack for overnight storage (14 trains) with Yonge Subway extension	No	– For Richmond Hill Centre extended tailtrack only (1)
2	Full Wilson Yard Expansion	– Expansion of Wilson Carhouse/storage beyond TR expansion – No use of Davisville Yard for revenue trains – Extended RHC tailtrack for overnight storage with Yonge Subway extension (14 trains)	Yes	– For Richmond Hill Centre extended tailtrack only (1)
2A	Full Wilson Yard Expansion/Continued use of Davisville for limited revenue service trains	– same as Option 2 except 6-8 revenue service trains stored/cleaned at Davisville Yard	Yes	– For new Yonge yard/carhouse (25 acres)
3	New Yonge Storage and Maintenance Yard	– New Yonge storage and maintenance yard – RHC tailtrack same as Finch (4 trains) – No use of Davisville for revenue service trains	Yes	– For new Yonge storage yard (10 acres)
4	New Yonge Storage Yard	– New Yonge storage yard – Remainder at expanded Wilson Yard – No use of Davisville for revenue service trains	Yes	– For Richmond Hill Centre extended tailtrack plus property impacts of Wilson Yard connections (1)
5	Option 2 Plus Sheppard Subway (Yonge-Downsview)	– Same as Option 2 plus Sheppard Subway and mainline connection from Wilson Yard to Spadina/Sheppard Lines	Yes	– For Richmond Hill Centre extended tailtrack only (1)

(1) See Exhibit 1 for a concept of the Richmond Hill Centre Station extended tailtrack

Exhibit 1 – Richmond Hill Tailtrack

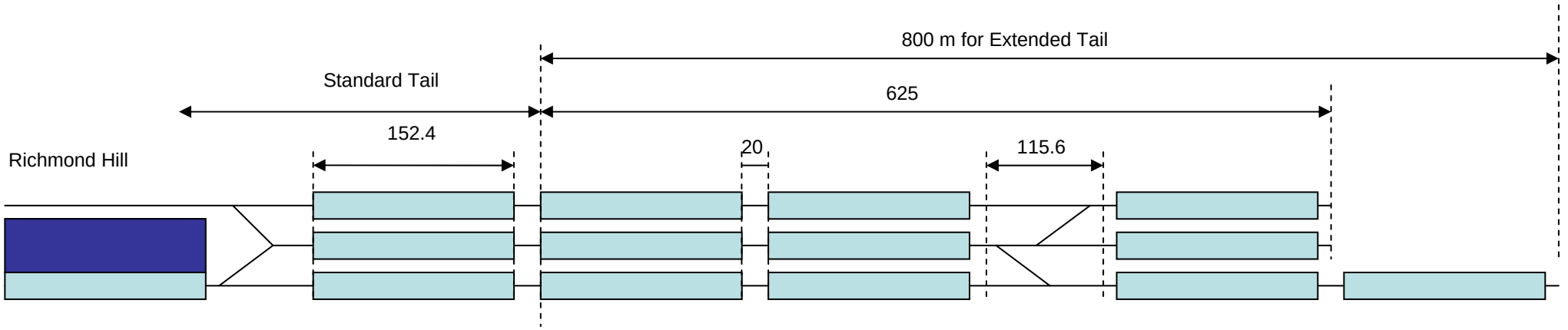

Table 2

Option	Description of Yard Expansion Option	Type of Expansion	Train Capacity (Number of Trains)							
			Davisville Yard	Wilson Yard	New Yonge Yard	TYSSE - VCC	Yonge Subway Extension - RHC	Total Capacity Available	Capacity Required	Capacity Deficit
1	Limited Wilson Yard Expansion *	A	8	51	0	4	14	77	88	-11
		B	8	51	0	0	0	59	88	-29
		C	0	39	0	0	0	39	88	-49
2A	Same as Option 2 except some non-revenue trains at Davisville	A	6 - 8	62 - 64	0	4	14	88	88	0
		B	0	88	0	0	0	88	88	0
		C	0	88	0	0	0	88	88	0
2	Full Wilson Yard Expansion	A	0	70	0	4	14	88	88	0
		B	0	88	0	0	0	88	88	0
		C	0	88	0	0	0	88	88	0
3	New Yonge Subway Storage/Maintenance Yard	A	0	39	41	4	4	88	88	0
		B	0	39	49	0	0	88	88	0
		C	0	39	49	0	0	88	88	0
4	New Yonge Subway Satellite Storage Yard Only	A	0	70	10	4	4	88	88	0
		B	0	70	18	0	0	88	88	0
		C	0	80	0	0	0	88	88	0
5	Same as Option 2 plus Sheppard Subway Connection to Wilson Yard (Yonge to Downsview)	A	0	70	0	4	14	88	88	0
		B	0	88	0	0	0	88	88	0
		C	0	88	0	0	0	88	88	0

A - Storage and Daily Cleaning of Subway Vehicles
B - Washing of Subway Vehicles
C - All other maintenance of Subway Vehicles
[ ] - Growth in Yard Capacity with each option
* - Dropped from further consideration

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Table 3

Overview of Net Present Value of Total Costs*

Option	Capital Costs	Operating Costs			NPV of all Costs (to 2030)
		Deadhead Mileage Costs	Building Operation Costs	Total Operating Costs	
2 / 2A**	$575.5 m	$46.7	$16.9 m	$63.6 m	$639.1 m
3	$632.0 m	$35.9	$24.9 m	$60.9 m	$692.9 m
4	$662.0 m	$46.7	$16.9 m	$63.6 m	$725.6 m
5	$2322.9 m	$35.9	$16.9 m	$52.8 m	$2375.7 m

* Option 1 did not provide sufficient yard capacity for the projected fleet size to 2030 and was therefore not comparable to the remaining options. Option 1 was eliminated from further consideration and the NPV Analysis of this option is not presented.

** An NPV for Option 2A was not calculated. The NPV for Option 2A is expected to be less than the cost of Option 2 due to reduced deadhead costs of between $300,000 - $400,000 per year.