REGIONAL MUNICIPALITY OF YORK

YORK RAPID TRANSIT PROJECT/ YORK REGION TRANSIT

TRANSIT STORAGE AND MAINTENANCE FACILITIES STRATEGY FOR YORK REGION

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APPENDIX

1. INTRODUCTION

The Region of York's public transit agencies, York Region Transit (YRT) and Rapidco, have investigated the future facility requirements necessary to maintain the Region's combined fleet of conventional/rapid transit/specialized transit vehicles and accommodate the future administrative and operations needs of the Region's transit services. The objective of the study was to determine the number, size and general location of the required facilities. A horizon year of 2031 has been selected which coincides with the current planning timeline for the York Transportation Master Plan. This report documents the results of the study.

This investigation takes into account the analysis of a permanent central integrated Regional maintenance facility for Viva bus and/or light rail services and YRT local bus services in the Langstaff industrial area. Environmental clearance is being sought for this permanent facility within the process of the North Yonge Street EA and is based on environmental analysis and operational studies completed in support of that EA. In addition, York Region recently acquired a facility in Newmarket to serve as the North Facility for the Viva BRT service and uses a contractor-provided facility in Vaughan for the initial Viva service in the south. The role of these facilities is also addressed within the context of the overall facility strategy.

The transit facility analysis includes:

1. Forecast of Future Population and Transit Fleet Requirements to 2031
2. Definition of a vehicle maintenance strategy
3. Development of a facility strategy, associated requirements and preferred locations
4. Preparation of preliminary capital cost estimates for the recommended facilities
5. Development of an implementation plan
6. Recommendations

This report presents the results of the study and proposes a future vehicle maintenance and facility strategy for York Region's transit services. It then describes the operational and financial implications of the strategy and lays out an implementation plan.

This study assumes that the Region will construct its own facilities, as contemplated by the establishment of the Langstaff facility and the existing use of the Viva North Maintenance Facility. This policy allows the Region to consider contracting proposals without reference to actual local land or facility holdings of any proponent, thus establishing a "level playing field" for all proponents on performance criteria alone. It also allows the Region to take advantage of its own sources of capital funds, which generally are less costly than what is available to private sector borrowers.

For purposes of this study, all transit fleet requirements of York Region are taken into account. No distinction is made regarding the suppliers of vehicles nor the services they are dedicated to. Thus the fleet requirements include Viva rapid transit vehicles, YRT vehicles supplied through the existing operating contractors and vehicles supplied by neighbouring transit agencies, namely, TTC and Brampton Transit.

2. EXISTING YORK REGION TRANSIT SERVICES

Transit services in York Region are managed by the Region's transit branch, York Region Transit (YRT). Existing transit services are contracted to three private operators, Miller Transit, Laidlaw and Can-Ar. In addition to these services, the Toronto Transit Commission (TTC) provides extensive service under contract to the Region on the north-south corridors that represent extensions of its base city services. GO Transit provides independent inter-regional commuter service in the Yonge Street corridor from Newmarket and Aurora to Finch Terminal and York Mills in Toronto, as well as on Highway 9/Davis Drive, and Highways 48, 404 and 400.

YRT: The York Region Transit fleet currently consists of 240 conventional transit buses in three sizes: 9.1 metre (30 foot), 10.7 metre (35 foot) and 12.2 metre (40 foot); plus a small fleet of specialized transit vehicles specifically designed to serve people with disabilities. Many of the conventional transit buses are either low-floor or are equipped with wheelchair lifts and are therefore able to serve persons with disabilities on conventional transit routes. This conventional fleet total excludes the following: the TTC buses currently contracted to provide north-south services; the GO Transit buses used to provide inter-regional service within York Region, as well as the Brampton Transit buses which jointly operate Route 77 with YRT between Finch Subway Terminal and Bramalea Shopping Centre via Highway 7. Together, these services would add an equivalent of approximately 68 buses (31 each for GO and TTC and 6 for Brampton Transit), plus spares, to the York Region transit fleet total.

Viva Rapid Transit: New rapid transit services have been instituted by the Region in partnership with York Consortium 2002 (YC2002). The first phase of these new services is Bus Rapid Transit, known as Viva, serving four major corridors within the Region and beginning in September 2005. Viva supplements existing local services provided by YRT and will utilize 85 advanced-design rapid transit buses in both 12.2 metre (60 units) and 18 metre (60 foot) articulated (25 units) lengths. This new service is managed by YRT and operated by Connex.

3. FUTURE TRANSIT NEEDS AND FLEET REQUIREMENTS

The horizon year for this study is 2031, which is consistent with the Region's Transportation Master Plan (TMP). The Region's TMP has established an aggressive transit-supportive strategy which would see the transit modal split increase from the current level of approximately 8% to about 17% per peak period by 2031. This significant emphasis on the use of public transit to meet a large portion of the Region's future transportation trips will require a major increase in the level of transit services and consequently a large increase in the size of the public transit vehicle fleet by 2031.

The final estimate of future transit needs up to 2031 and, in turn, an estimate of the future public transit fleet to support it requires knowledge of detailed route network design and detailed service levels throughout the years. However, a reasonable calculation of overall future fleet size to cover estimated future service levels can be and has been prepared using a "population per transit vehicle" ratio applied to future Region population estimates. A suitable "Population/Transit Vehicle" ratio for York Region has been applied by considering the Population/Transit Vehicle ratios which currently exist in other Canadian urban jurisdictions of similar size. As a control for reasonableness, this fleet size estimate was further checked by additional calculations using additional transportation planning methods

3.1 Transit Fleet Sizes in Other Jurisdictions

Table 1 presents a summary of population, transit ridership levels and fleet sizes for selected cities across Canada. For Toronto, Montreal, Vancouver and Calgary, the vehicle totals also include their rail services. From this data, a "population per transit vehicle" ratio was calculated. The general trend of this measure shows a decrease in the ratio as the population increases, indicating a larger fleet per population in the major urban areas. Although the associated modal split (transit vs. automobile proportions) ratios are not available, the average annual number of rides per person can serve as a rough surrogate for this measure. It generally follows that as city size and population increases, transit use and the transit modal split also increase. Therefore, as a future reference for York Region, it can be expected that as its population increases so will transit use and the size of its transit fleet to levels at least equal to those in cities with population levels equivalent to the Region's future population projections. Thus it is reasonable to assume that the Population/Transit Vehicle ratio for the cities identified in Table 1 can serve as a general guideline for estimating the future size of the transit fleet in York Region for the horizon year of 2031.

Except for Vancouver, the Population/Transit Vehicle ratio trends towards 1,000:1 or lower as population levels increase to 1 million and above.

Table 1 - Summary of Population per Transit Vehicle Ratios for Selected Cities In Canada

City	Population (2004)	Transit Ridership (2004)	Rides/ Capita	Transit Fleet Size	Population/ transit vehicle Ratio
Barrie	125,000	1,906,503	17	35	3,571
Windsor	207,960	5,627,428	27	96	2,166
Brampton	400,965	8,381,335	22	150	2,673
Region of Waterloo	434,000	11,966,048	29.5	181	2,398
Quebec City	517,920	37,559,209	72.5	496	1,044
Mississauga	695,000	25,433,107	36.6	345	2,014
Winnipeg	647,600	38,618,376	64.6	535	1,210
Calgary	933,495	79,510,800	85.2	890	1,049
Ottawa	854,300	88,779,641	118.2	903	946
Vancouver	2,132,824	155,594,015	73	1,441	1,480
Montreal	1,876,932	358,430,000	191	1,568	1,197
Toronto	2,481,494	418,099,000	168.5	1,475	1,682
***York Region**	**889,591**	**13,815,517**	**15.5**	**308**	**2,888**

* (incl. TTC, GO and Brampton Transit)

3.2 Future Region Population Estimate

Table 2 presents the Region's projected population levels by municipality to the year 2031 based on data provided by the Region's planning department. This information will be used to estimate future transit fleet requirements for the Region as discussed in the following sections.

Table 2
Summary of Population Projections for York Region Municipalities
2001 – 2031

Municipality	Year					
	2001	**2006**	**2011**	**2021**	**2026**	**2031**
Aurora	43,000	49,900	58,900	75,000	82,000	89,000
E.Gwillimbury	23,000	27,500	33,700	56,000	66,000	77,000
Georgina	39,000	45,900	53,700	73,000	81,000	90,000
King	20,000	22,400	26,400	35,000	39,000	42,000
Markham	218,000	258,000	295,200	353,000	380,000	407,000
Newmarket	71,000	80,500	91,500	103,000	109,000	110,000
Richmond Hill	140,000	174,400	200,700	230,000	240,000	245,000
Vaughan	194,000	225,400	266,900	335,000	360,000	390,000
Whitchurch-Stouffville	24,000	27,500	33,000	40,000	43,000	50,000
Total	**771,998**	**910,000**	**1,060,000**	**1,300,000**	**1,400,000**	**1,500,000**

Source: The growth outlook for the Greater Golden Horseshoe plus municipal growth assumptions based on the percentage increases from earlier versions provided by the Region of York Planning.

3.3 Calculating Future York Region Transit Fleet Size

To determine the projected transit fleet needs of the Region from the present to the horizon year of 2031, a multi-step process of analysis was constructed and applied. The steps are based on existing YRT transit analysis exercises and on the YRTP Business Plan for Viva. Additional steps for the more distant years extrapolate from these documents and are based on increasing population and employment projections, use of progressively more urban population/bus ratios and an application of a modal split calculation. An additional method was employed as a check on these projections. These steps are as follows:

1. YRT and Viva fleet projections to the year 2013
2. Future fleet size to the year 2031 at current ratios
3. Modified ratios to reach modal split goals
4. Factoring for impact of LRT
5. Alternate method based on employment forecasts

YRT and Viva fleet projections to the year 2013

As part of its ongoing annual budget development process, YRT prepares a 10 year estimate of transit service expansion, which includes a projection of the Region's transit fleet size to 2013. Similarly for the Viva service, the YRTP Business Plan includes estimated fleet requirements to 2013 and beyond. These estimates are summarized together in Table 3. The YRT fleet estimates are distributed according to four municipal areas in the Region, which correspond to the areas of operation of the current YRT transit contract contractors. The YRTP fleet estimates relate to the four-corridor BRT service networked as a whole.

The YRTP service projections for 2013 indicate that the Viva fleet will more than double from 85 units to 183 units. YRT projections indicate a total fleet increase from 240 units in 2004 to 416 units by 2013 for a combined YRT/Viva fleet of 599 units by that date. The Viva fleet of 85 buses consists of sixty 12.2 metre and twenty-five 18.0 metre articulated buses with subsequent vehicle orders concentrating on 18 metre versions. The YRT fleet is anticipated to continue to be a mix of 9.1metre (30 foot) and 12.2 metre (40 foot) buses. The 10.7 metre (35 foot) buses will be phased out over time.

Table 3: Summary of YRT and Viva Fleet Estimates: 2004-2013

Year	YRT (by municipal area)				YRT Total	Viva*	Total Vehicles
	1 (Markham)	2 (Newmarket)	3 (Richmond Hill)	4 (Vaughan)			
2004	66	34	70	70	240	-	**240**
2005	72	41	72	75	260	85	**345**
2006	77	49	88	76	290	85	**375**
2007	82	52	92	82	308	94	**402**
2008	85	57	97	87	326	112	**438**
2009	90	60	102	92	344	129	**473**
2010	95	64	105	98	362	145	**507**
2011	100	67	110	103	380	149	**529**
2012	103	71	114	110	398	166	**564**
2013	108	74	118	116	416	183	**599**

* Based on YRTP Business Plan

The combination of these two near- and mid-term estimates form the basis of the 2013 fleet size estimates of 599 vehicle units, as used in this study. The YRT columns reflect total Regional needs and do not distinguish between YRT-owned vehicles and those operated by neighboring agencies, such as the TTC, Brampton Transit or GO Transit. It is expected that these neighboring vehicles will be replaced over time with YRT-owned units.

Future Fleet Size to the year 2031 at current municipal ratios

Based on the foregoing 2013 fleet estimates and population projection for the Region and its constituent municipalities, a Population/Transit Vehicle ratio for each operating division (and municipal grouping) and for the Region as a whole can be calculated.

Table 4 in the Appendix provides a summary of this information and the resulting Population/Transit Vehicle (Population/Bus) ratio for the years 2004, 2006 and 2013. For ease of presentation, the municipal populations have been grouped into the four municipal areas. The Viva fleet, expressed as standard 12.2 m bus units, has been apportioned to these geographic divisions (or operating areas) based on the following preliminary projections of vehicle utilization along the four BRT corridors for 2006:

Yonge Street, north of Bernard (Aurora/Newmarket division)	10 vehicles
Yonge Street, Finch to Richmond Hill	15 vehicles
Markham/Highway 7 east/Warden North-South	29 vehicles
Vaughan North-South, Highway 7 west	31 vehicles

An expanded Viva fleet of 183 total units, estimated for 2013, has been distributed proportionally to the YRT operating areas.

Using this data, the Population/Bus ratio for the Region would be 1,993 overall but would vary by municipal areas as follows:

- Richmond Hill 1,330
- Vaughan 1,582
- Markham 1,983
- Newmarket/Aurora 2,968

The range of Population/Bus ratios between the four areas reflects likely variations in projected levels of transit service and, accordingly, the number of buses required to provide transit service in each area. The exact distribution of vehicles will be determined by service levels as they develop over the next years.

For the period beyond 2013 to 2031, the foregoing 2013 Population/Bus ratios for the Region and the operating areas have been used in conjunction with the Region's population estimate to project the potential transit fleet size to 2031. Table 5 in the Appendix and its Summary below show the result of this analysis, which indicates the following fleet totals.

Table 5 (Summary) – Future Total Fleet Estimates
Based on 2013 Population/Bus Ratios

Year	2021	2026	2031
Bus Units	703	757	810
Pop./Bus Ratio	1,500	1,250	1,000

Modified Ratios to Reach Regional Modal Split Goals

As noted earlier, the Region's TMP calls for the peak period transit modal split to increase to 17% by 2031[1], from approximately 8% in 2001. Since this modal split is not planned to be achieved by 2013, using the 2013 Population/Bus ratio to project the transit fleet requirements beyond that date may underestimate the level of transit service and fleet required to achieve the 17% modal split target.

Therefore, a more urban Population/Bus ratio would provide a more accurate estimate than current suburban conditions. The data presented in Table 1 for other Canadian cities demonstrates that for cities with high ridership levels and corresponding high modal split values, lower Population/Bus ratios will be observed. This reflects, in turn, the higher levels of transit service required to achieve those service levels. Accordingly, if the Region is to achieve its transit modal split target of 17% by 2031, lower Population/Bus ratios will most likely prevail beyond 2013.

Table 1 shows that in Toronto, Ottawa, Montreal, Quebec City, Calgary and Vancouver, Population/Bus ratios range from 1,700 down to a low of 900. An intermediate level

[1] The 17% goal is defined in the June 2002 York Region Report "On the Move."

would be in the range of approximately 1,000. On this basis, a Population/Bus ratio of 1,000 would be an appropriate measure to estimate the Region's transit fleet requirements by 2031, which would support service levels that would be needed to achieve the planned 17% transit share of regional work trips in the peak hour and peak period. Since the increase in service levels and, therefore, fleet size would be progressive, interim ratios for 2021 and 2026 should also be used, being progressively reduced from the 2013 ratio of 1,884.

Table 6 in the Appendix and its summary below present fleet estimates for the years 2021, 2026 and 2031 using progressively more urban Population/Bus ratios, which produce the following fleet projections :

Table 6 (Summary) – Population and Fleet Ratios
Based on Incremental Urban Service Ratios

Year	Region Population	Ratio	Unit Fleet Size
2021	1,300,000	1,500	867
2026	1,400,000	1,250	1,120
2031	1,500,000	1,000	1,500

Effectively, the lower Population/Bus ratio analysis, responding to the Region's expected growth in population and employment, projects that the size of the Region's transit fleet would be twice as large by 2031 compared to the projection developed using the 2013 population/bus ratio. While this increase of the fleet size may seem very large, with the 2031 figure representing an increase of 1,260 vehicles over the 2004 fleet total of 240, the figure can also be expressed as an incremental increase of fleet size by approximately 47 bus units per year for the next 27 years.

Factoring for Impact of LRT

Future plans for light rail transit ("LRT") along the major corridors in the Region and extension of the TTC Yonge-Spadina subway to York University may mitigate the size of the projected 2031 bus fleet. The calculations above are expressed in standard bus units (12.2m lengths). Since LRT trains would replace these units at a multiple (two, three or more) on the designated rail corridors, the number of actual buses may be lower. However, the specific impact on the size of the 2031 bus fleet cannot be estimated at this time, although it would be reasonable to assume a somewhat reduced number of buses in the fleet. It is important to recognize that while the larger LRT vehicles would supply some of the capacity now calculated in bus units, the total overall capacity will still need to be produced and operated in the region.

Alternate Calculation

As a check on the above calculation methodology and on the relative sensitivity and reasonableness of the assumptions, the study also made a second calculation based on employment forecasts and the modal split goal of 17% of journey to work trips. In this case the following assumptions were made:

Population	1,500,000
Employment	780,000
Peak period employment trips 17% transit	132,600
Bus capacity	57 (38 seated + 1.5 standing load)
Average inbound runs per bus over 3 hour peak period	1.5 (assumption that many routes are more than one hour long)
# of buses for peak period	**1,551 buses** **(** 132,600 trips / 1.5 runs = 88,400 trips / 57 persons)

This alternate calculation results in a range of bus units from 1,163 to 1,551, which corroborates the methodology used in the main part of the study. Variations in assumptions on run lengths, peak hour concentrations or bus capacity will move the range up or down by a modest amount. However, the rough equivalent of the methodological results is reassuring and strengthens the validity of the fleet size estimates and the consequent estimates for required facilities that follow in the next sections.

3.4 Conclusion

Based on the foregoing analyses, using a Population/transit vehicle ratio of 1,250 to 1,000 after the year 2013, which mirrors the trend observed in other large Canadian cities with urban transit service levels, combined with the Region's population estimates to 2031, the Region's transit fleet is projected to increase to between 1,120 vehicles and 1,500 vehicles by 2031. These numbers form the basis for projecting future transit facility requirements in York Region to the 2031 horizon year.

4. FLEET DEPLOYMENT

4.1 Status of Existing Facilities

There are currently three facilities in use within the Region provided by the local operations and maintenance contractors. These generally correspond to the four municipal areas where YRT services are offered. (Richmond Hill and Markham are operated from a single facility located on Woodbine Avenue just south of Highway 407.

For the Viva services introduced in September 2005, the Region has secured a facility in Newmarket (the former Newmarket Truck Centre) to accommodate most of the Yonge Street service and to handle major maintenance for the Viva fleet. A second facility on Caldari Road in Vaughan has been provided by the operating contractor, Connex, to accommodate the Highway 7 corridor services and the balance of the Yonge Street service in the initial years.

4.2 Facility Requirements and Locations

On the basis of the foregoing recommended facility strategy, the 2013 fleet total of 599 vehicles and 2021 total of 867 vehicles (reduced population/bus ratio) and the geographic distribution of these fleet totals indicates that there will be need for a minimum of three facilities within the Region based on an average facility size of 250 vehicles. A closer examination of the geographic distribution of the Regional transit fleet by 2021 suggests that four facilities would be required in all cases, as follows:

Table 7 - Preliminary Transit Facility Capacity Requirements to 2021

Municipality	**Fleet Size**		**Optimum Facility Size**	**Number of Sites**
	2013	**2021**	2013 -- 2021	2013 -- 2021
Aurora/Newmarket	94	149	200	1
Markham/Stouffville	172	264	250+	1
Richmond Hill*	156	205	250	1
Vaughan	177	250	250+	1
Total	**599**	**867**	**950**	**4**

* Location of YRTP central facility for the purpose of this report considered as Richmond Hill although located in Town of Markham.

This data suggests that four facilities will be the minimum required to support Viva/YRT under any service scenario. However, to base the Region's facility needs on the 2021 requirements alone may be misleading for the reasons discussed in Chapter 3. As illustrated in Table 7 above, there would be limited space available with the four facilities to accommodate any fleet growth beyond 2021 under more aggressive urban transit service ratios. Therefore, it is important to look beyond the 2021 fleet projections to the

requirements as they may exist in 2031 in order to determine the most appropriate facility strategy.

The projected 2031 fleet total of 1,120 to 1,500 buses discussed in section 3.5 suggests a need for additional facilities, possibly up to seven in number, in the same geographic areas as the four facilities delineated above. The seven facilities may be distributed geographically as follows:

Table 8 - Preliminary Transit Facility Capacity Requirements to 2031

Municipality	Fleet Size		Optimum Facility Size		Sites	Sites
	2026	2031	2026	2031	2026	2031
Aurora/Newmarket	179	257	175	250	1	1
Markham/Stouffville	340	457	200 + 150	250 + 250	2	2
Richmond Hill	273	354	250+	250 + 150	1	2
Vaughan	328	432	200 + 150	250 + 250	2	2
Total	**1,120**	**1,500**	**1,125**	**1,650**	**6**	**7**

Clearly, actual sizes would be refined in future years as the Region's transit fleet maintenance strategy and geographic distribution of transit services mature.

Combined with the data found in Table 7, the fleet requirements argue for a geographically distributed need for at least four facilities, with an additional facility in some or all of the geographic areas, up to a total of seven in total.

4.3 Fleet Distribution

By 2013, the combined YRT and Viva fleets will be in the order of 599 units and operationally could be divided up as follows:

Table 9 - Geographic Distribution of Vehicles by Area

Site	YRT	Viva	Total
Newmarket	74	8	82
Markham	108	12	120
Richmond Hill	118	149	267
Vaughan	116	14	130
Total	**416**	**183**	**599**

In the event that the Region continues its present policy of having separate contractors operate and maintain the YRT and VIVA fleets; buses outposted to foreign garages could be cleaned, washed, refueled and stored on an ongoing basis and the costs incurred in providing these services would be charged back to the contractor outposting the equipment. (This is a common practice with such operators as GO Transit, who maintain a similar arrangement for its outposted equipment throughout the GTA).

4.3.1 Richmond Hill

For Richmond Hill, the central facility at Langstaff is expected to be operational by 2008-09 and can accommodate approximately 250 vehicles (potentially both the Viva and YRT local area fleets) which would total approximately 200 units by January 2006. As noted previously, most of the Viva equipment would be located at this facility with additional equipment outposted to Newmarket, Vaughan and Markham for the purpose of starting peak period services in each corridor.

4.3.2 Vaughan

Vaughan's portion of the Region fleet will be 177 vehicles. This fleet could still be accommodated by a Vaughan-based O&M contractor at least until a new facility large enough to house a fleet of 250 vehicles, based on future fleet projections for the Vaughan area, was built. A facility of this size would require the purchase of a 15 acre site minimum.

4.3.3 Newmarket

In the north, a YRT local service fleet made up two-thirds by 9.1-metre and one-third by 12.2-metre buses means the current Viva North Maintenance Facility garage could accommodate the service demands until approximately 2013. However, by that time a new facility would have to be operational to accommodate continued growth in this area of the Region. Based on the fleet projections discussed earlier, a facility size in the range of 250 vehicles and located on 15 acres, preferably in a suitably zoned industrial area and adjacent to major arterial roads for ease of access to local routes, would be required.

4.3.4 Markham

For the Markham area, based on an estimated mix of sixty-six percent 12.2-metre vehicles and thirty-three percent 9.1-metre vehicles, by 2013 continued service expansion would see the fleet grow from 111 to 161 units. This level of expansion together with further growth beyond 2013 indicates that a new facility able to accommodate approximately 250 vehicles would be required. A 15 acre parcel of land would be required for this facility and should be located in a suitably zoned area in Markham.

4.4 Conclusion

The projected 2031 fleet total of 1,120 to 1,500 buses suggests the need for as many as seven facilities distributed geographically throughout the region as follows:

Aurora/Newmarket	1 facility	250 bus capacity
Markham/Stouffville	2 facilities	250 and 250 bus capacities
Richmond Hill	2 facilities	250 and 150 bus capacities
Vaughan	2 facilities	250 and 250 bus capacities

It is anticipated that the facilities being provided by the Region for Viva will be sufficient for the initial phases of the service to approximately 2008 based on the service expansion projections. By that time, the North Facility will have reached its practical capacity of 41 articulated buses. Similarly, by 2008-2009, the South Facility will reach its practical

operating capacity. The Langstaff central maintenance and storage facility is expected to be ready for occupancy in 2008-09 affording some capacity relief for the North and South facilities. For example, after the opening of the Langstaff facility, only 6 to 8 vehicles would remain at the North Facility while a dozen Viva vehicles will be required to remain at the South Facility for the purposes of servicing the west end of the Highway 7 Corridor. On this basis, following the opening of the Langstaff facility, the North facility can be made available to YRT and should be able to accommodate further YRT and Viva fleet expansions until approximately 2013.

Once the Region constructs the permanent facilities in both areas, the Viva/YRT fleets could transition from the North and South facilities to the new facilities.

4.5 Implementation Plan

Since the acquisition of property at Langstaff for the central maintenance and storage facility is essential to the development of the overall system, land assembly should begin immediately upon receiving approval to proceed from Council. The land acquisition process will take a minimum of fourteen months (i.e. October 2005 to November 2006). Site plans could be prepared and contract documents prepared at the same time, so that construction could start in late 2006 and be completed in late 2008.

The acquisition of property for the Markham, Vaughan and Newmarket facilities should be undertaken in the period immediately and in parallel to the opening of the Langstaff facility and construction of these facilities would be based on the needs previously identified in this report as the transit systems expand.

YRT Proposed Property Acquisition Timeline

YEAR	ACTIVITY
2005-2008	Identify and purchase land for 3 facilities, one each in Markham, Vaughan and Newmarket
2008-2010	Construct permanent satellite facility in Markham
2008-2010	Construct permanent satellite facility in Vaughan
2010-2012	Construct permanent satellite facility in Newmarket
2008-12	Staged transition of the YRT fleet from contractor-owned facilities

VIVA Proposed Property Acquisition Timeline

YEAR	ACTIVITY
2005-06	Purchase land for Langstaff
2005-08	NMF location serves as a Viva facility until the construction of Langstaff in 2008 and then becomes a satellite
2005-06	Purchase land for Langstaff
2005-06	Plan / design Langstaff central facility
2006-08	Construct Langstaff
2008 (late)	Occupy Langstaff
2008	Transition of Viva fleet from NMF to permanent facilities in Newmarket and Markham

5. VEHICLE MAINTENANCE

Vehicle maintenance facility requirements are defined to a large extent by two factors:

1. Identification of an appropriate vehicle maintenance strategy best suited to the delivery of transit services; and
2. Projection of future transit vehicle service levels, staffing numbers and fleet size.

These elements, in turn, define the future facility requirements in terms of size (storage and maintenance capacity) and type of facility, such as a central maintenance with satellite garages, or a stand alone operating and maintenance depot specifically designed to effectively maintain a portion of the transit fleet. The determination of an appropriate vehicle maintenance strategy is based on several factors including the future size and mix of the transit fleet, the degree to which certain vehicle maintenance activities are carried out "in house" as opposed to being "contracted out" elsewhere, possible alternate future uses of existing facilities (for example, the Viva north maintenance facility in Newmarket) and the impact of "deadhead" travel costs on overall transit operations.

For larger transit systems the most practical and economic size for a transit maintenance and storage garage appears to be one that accommodates up to a maximum of 250 vehicles, regardless of the type of maintenance activities carried out at the facility. Apart from the requirements associated with bus servicing, storage and maintenance, these complexes must also provide for operating, supervisory, administrative and office personnel, as well as associated parking requirements and any landscaping treatment needed to satisfy local by-laws and site planning requirements.

In municipalities with rapidly expanding residential development (the source for increasing transit demand), the practice of maintaining fleets in one central location may need to bow to the advantages gained through decentralizing the fleet. A further result of decentralization would be the opportunity to operate individual garages through separate contractors.

5.1 Vehicle Maintenance Options

Maintenance practices are by necessity closely related to the design resources and constraints of their physical facilities, even though a transit agency can "gear up" to undertake any maintenance or repair function required to meet operational needs. Organizationally these needs can be met either by a central facility with outlying satellite facilities or by multiple largely independent facilities across a geographic region. A discussion of factors in support of each of these policy directions takes place below.

5.2 Viva (BRT)

The adoption of a facilities policy for an integrated York Region transit fleet will build on a review of current practices and the newly established presence of Viva. The YRTP business plan foresees a Region-owned central maintenance facility for the next stage of

Viva BRT service and environmental clearances are being sought for this course of action for Viva expansion.

5.3 YRT (Conventional Transit Fleet)

Considering the projected future size of York Region's transit fleet developed in chapter 3, its operating territory and the Region's current practices of contracting vehicle operations, a promising vehicle maintenance approach for the Region would be to develop vehicle service and maintenance facilities in selected areas of the Region. This would maximize maintenance efficiency and effectiveness.

York Region could decide to follow the example of many larger transit systems with multiple facilities, which either favor a strategy of establishing a centralized heavy maintenance facility supported by satellite facilities or continue to follow the current historical practice for YRT local transit, of operating independent stand-alone contractor service divisions that encompass all maintenance functions for that geographical service area, as discussed in section 4.2.2. A transition from the current independent geographic paradigm to an integrated central and satellite strategy would only be undertaken as a result of a process of research and consultation within the Region and following a process of constructing and substituting Region facilities for those supplied by division contractors. Whatever the outcome in this regard, industry consensus calls for facilities to be ideally limited to a maximum of 250 buses. In York Region's case as in others, the number and size of the facilities is ultimately determined by geography and the operational characteristics of the transit system. In addition, it is expected that the storage and operation of an appropriate portion of the Mobility Plus paratransit vehicle fleet can be accommodated at each of the transit maintenance facility sites throughout the Region.

5.4 Strategy for Heavy Repairs

As discussed in section 4.2.2, York Region Transit has embraced the practice of "contracting out" its transit operations to the private sector who currently are responsible for servicing, maintaining and storing the YRT fleet in each operating division. This, coupled with the Region's geographic location in the GTA with its concentration of specialized services who can accommodate any major repair required to maintain buses; relativizes the need to consider the more traditional structure of providing centralized and satellite facilities as found in older more established properties such as the TTC.

The fact that all major repair functions can be performed "off site" and yet "locally" within the GTA may result in measurable economies for YRT, since there would be a lesser need to retain either the staff or the equipment required to perform major repairs/maintenance functions. Thus, each of the new Regional facilities developed at the 'compass points' can be designed to perform light or ongoing servicing in addition to bus storage.

6. VEHICLE STORAGE

YRT is one of the few transit agencies in Ontario that allows outside storage of its fleet. This is in large measure due to the nature of the current contract-based operation of the transit services whereby the contractors provide self-sufficient maintenance facilities. The contractors store the buses in open-air compounds on–site, making provisions for cold weather operations by using on-site air and electrical plug-ins and auxiliary 'onboard' heaters or water heating systems. Even with these features in place, inclement weather forces the contractors to take extra precautions to ensure the availability of buses for service. Extra practices may include pre-service startup to warm up the buses and make sure the operating features are working (i.e. windshield wipers, wheelchair ramps etc.).

Outdoor vehicle storage is still the choice of the management of Mississauga Transit who have both indoor and outdoor facilities in their system. The City of Ottawa in its recent review of new garage needs has recommended support for future facilities with outdoor bus storage citing lower capital costs as being the prime example for support for this recommendation. Whereas, Toronto (TTC) whose last two garage projects have been designed with outdoor storage has now decided to revert to constructing its newest garage (Mount Dennis) with indoor bus storage citing operating and reliability factors as being paramount to the decision to return to indoor storage.

Further investigation on the issue of indoor vs. outdoor storage must be conducted during the design phase of facility development and taking into account local conditions and the experience of other transit agencies. Whatever the final outcome of this investigation, no appreciable difference in the amount of land required for any individual maintenance facility site would occur.

7. FACILITY FINANCE TIMELINE AND COST PROJECTIONS

7.1 Existing YRT Service Contracts

Over the course of the next year (December 2005 – June 2006), the current operating agreements with Miller, Can-Ar and Laidlaw are subject to renewal, and the Region is now in the process of extending these agreements for up to an additional five years to the end of 2010 and 2011 respectively. With these options exercised, contractor-supplied facilities will be available. Under the assumption that Viva would vacate their existing facilities in 2008 for the Langstaff facility, the Region could utilize the North facility for the YRT operations and fleets based in Newmarket and incorporate this provision into a new split tender for the service in the north.

7.2 Facility Cost Estimates

The establishment of Region-owned transit maintenance facilities will represent a major investment in public transit on the part of the Region. Order-of-magnitude cost estimates in 2005 dollars for each of the four facilities, excluding land, have been prepared based on general construction estimates and facility sizing guidelines.

A general guideline for estimating the required facility size for a specific vehicle capacity (based on MTO transit facility guidelines) is 93 m^2 (1,000 sq ft) per bus for storage, servicing, maintenance and support functions. Current construction estimates place the cost of constructing a transit facility in the range of \$1,615.00/m^2 (\$150/ sq ft). Thus, for example, a 150 bus facility (excluding land) would cost in the order of \$22.5 million (calculated as 150 x 93 m^2/bus x \$1,615/m^2). On this basis, the estimated cost to construct the four facilities identified as being required to meet the Region's transit fleet expansion plans to 2021 is \$142.5 million as summarized below (costs exclude land):

Table 10 - Estimated Construction Costs of Recommended Transit Facilities to 2021

Location	Vehicle Capacity	Facility Size	Estimated Cost	Year to Open
Langstaff	250 buses	23,250 m^2	\$37.5 million	2008
Vaughan	250 buses	23,250 m^2	\$37.5 million	2010
Newmarket	200 buses	18,600 m^2	\$30.0 million	2012
Markham	250 buses	23,250 m^2	\$37.5 million	2010
Total	**950 buses**		**\$142.5 million**	

These cost estimates contemplate indoor vehicle storage. Recent experience with outdoor storage facilities suggest that the capital cost difference compared to indoor storage is negligible when all factors (operating, environmental, safety) are taken into account. The estimated life of each facility is a minimum of 40 years.

As noted earlier in this report (section 4.3), the decision to build facilities with outdoor or indoor storage should be the subject of further review by the Region, however this does not impact the size of the property required to build a facility.

For the time period beyond 2021, a further three facilities of 500 bus total capacity are projected to be required and may cost in the order of a further $75.1 million.

The magnitude of these capital costs of these facilities will require the development of a long term capital program which will prioritize the timing, location and construction schedule for each garage. Accordingly, the year that each facility should be available (Year to Open) may be altered. It should be noted that, while these costs appear significant, the growth of the Region and its public transit service will also be significant over the next 25 years. As well, other municipalities of similar size have constructed their own transit facilities. Toronto, for example, recently (2003) opened a new 250 bus facility in Scarborough and is in the construction phase for another new 250 bus facility in northwest Toronto.

7.3 Financial Models For Operations And Maintenance Facilities In York Region

The financial strategy for acquiring and operating the O&M facilities for the Region will be independent of the decisions for the number and locations of these facilities. The Region will be following its established regulations and procedures for capital investment and land acquisitions. However, several primary considerations should be observed during the planning of any specific sites for transit use:

- Land will remain in public control, as much as possible. This conforms to established Region usage and gives the Region the most flexibility.
- Similarly, the actual facilities should also remain in public control, within the terms of any development agreement with a builder, developer and/or operating contractor. Facilities will be owned publicly at the end of any construction and/or operating arrangement, but may be held by other entities at times during the term of an agreement. Some exceptions may be negotiated as part of specific projects.
- This underscores the theoretical insight that the Region maintains its maximum independence if the ownership of facilities is held distinct from the operation and maintenance of the transit fleet. DBOM may, under certain circumstances, represent an exception to this principle, depending on provisions in the agreement. Still, the performance of an operating contractor should be judged primarily, if not solely, on performance and service delivery in the transit operations and maintenance arena, unencumbered by considerations of ownership of the transit fleet base facilities.

The following chart summarizes general information on the characteristics of three types of capital facility delivery for York Region public transit.

Category	Self Build	DBOM	3rd Party Builder
Basic description	Region owns land and builds facilities. Finances from public sources. Installs O&M contractor for contract term.	Region purchases land. Contracts with O&M operator to build and operate facility and transit fleet for contract term.	Region purchases land. Leases facility from developer, who builds to suit. Installs O&M contractor for contract term.
Status of Region in Arrangements	Landlord and Owner.	Tenant for term of lease.	Tenant for term of lease.
Ownership of Land (L) and Facilities (F)	L: Purchased at start, becomes Region asset F: Owned by Region	L: Purchased at start, becomes Region asset F: Revert to Region, per terms	L: Either purchased by Region or leased from Developer F: Ownership remains with Developer, per terms
Control of Operations	Independent of operating contractor.	Bound to builder/operator for term of contract.	Independent of operating contractor.
Maintenance of Facilities	Regional work force.	O&M contractor's workforce, shared with Region.	Landlord's workforce, shared with Region.
Length of Operating Lease	Independent. At will of Region.	O&M term runs parallel to and is linked to facility timetable.	Independent. At will of Region.
Length of Facilities Lease	Ownership by Region. N/A	Depends on reasonable term for amortizing facility cost.	Depends on reasonable term for amortizing facility cost.

Category	Self Build	DBOM	3rd Party Builder
Asset base	Region as owner is bound to site and property.	Region as leaseholder can walk away after term of contract.	Region as leaseholder can walk away after term of lease.
Provision of insurance on facilities	Region self-insured.	Through contractor's policies.	Through landlord's policies.
Openness to special cost-sharing arrangements (Joint venture opportunities)	Joint ventures possible. Caution toward private gain on lands acquired by expropriation.	Joint ventures possible.	Joint ventures invited; types of development varied.
Incidence of construction costs	Capital	Operating	Operating
Eligibility for participation of senior governments	Yes	No	No
Taxation (property rates and business taxes)	Regional government exemption (to be detailed).	Contained in lease payments to contractor.	Contained in lease payments to developer/landlord.
Utilities	Independent of ownership or operation.	Independent of ownership or operation.	Independent of ownership or operation.
Category	Self Build	DBOM	3rd Party Builder
Availability and/or probable use of expropriation power	High	Medium	Low
Influence in municipal regulatory processes (planning, EA, zoning, designations)	Modest	Low	Considerable
Finance as factor for location	Independent	Independent	Developer's own lands would be favoured.

8. RECOMMENDATIONS

Upon adoption of this maintenance facility strategy by Regional Council, it is imperative that the assembly of land for the Langstaff facility be undertaken as quickly as possible in order to establish a hub for the Viva fleet.

Although the first phase of Viva will be introduced using facilities currently available in Newmarket and in Vaughan under renovation and in the case of the south under design; the anticipated growth of the fleet and the ability to accommodate this expansion relies heavily on the commissioning of the central facility at Langstaff at the earliest opportunity.

Concurrently, the Region should proceed with the land assembly required to establish facilities in Markham, Vaughan and Newmarket respectively. This report suggests that these facilities should be brought on line between 2009 and 2012 when the existing Newmarket site has reached capacity.

In light of the significant capital outlay associated with the construction of the Region's transit facilities between 2008 and 2012; the Region should investigate all funding options available to it. Further examination of all options should commence immediately, but be carried out independently of land assembly and acquisition.

It should be noted that at least two to three years will be required to assemble land and to plan, design and construct any facility, but especially the central Langstaff facility. Given that the whole system will be experiencing a prolonged period of accelerated growth, it is essential that proper facilities be available in time to ensure that service delivery can be maintained. This will require moving forward as quickly as possible on the acquisition of land for the designated facilities.

It is recommended that the Region:

1. Approve in principle a policy of transitioning from contractor-owned transit operations and maintenance facilities to constructing its own transit operations and maintenance facilities in future, subject to the preparation of an appropriate capital financial plan;
2. Begin to acquire the necessary land in the Langstaff industrial area for the purposes of constructing a transit operations and maintenance facility for Viva;
3. Begin the planning and design process for a Langstaff transit operations and maintenance facility for Viva; and,
4. Identify and purchase suitable lands in the municipalities of Markham, Vaughan, and Newmarket for the purpose of constructing transit operations and maintenance facilities to be available in the time period 2009 - 2012.

Appendices

Table 4
York Region Transit Vehicle Fleet and Population Projections by Municipal Area
2004, 2006, 2013

Municipality	2004					2006					2013				
	Population	Fleet Size				Population	Fleet Size				Population*	Fleet Size			
		YRT	YRTP	Total	Pop./Bus		YRT	YRTP	Total	Pop./Bus		YRT	YRTP	Total	Pop./Bus
Aurora/Newmarket/ E. Gwillimbury/ Georgina/King	196,000	34	-	**34**	**5,765**	226,000	49	9	**58**	**3,897**	279,000	74	20	**94**	**2,968**
Markham/Whitchurch-Stouffville	242,000	66	-	**66**	**3,667**	285,000	77	30	**107**	**2,664**	341,400	108	64	**172**	**1,983**
Richmond Hill	140,000	70	-	**70**	**2,000**	174,000	88	15	**103**	**1.689**	207,500	118	38	**156**	**1,330**
Vaughan	194,000	70	-	**70**	**2,771**	225,000	76	31	**107**	**2,103**	280,100	116	61	**177**	**1,582**
Total	**771,998**	**240**	**-**	**240**	**3,217**	**910,000**	**290**	**85**	**375**	**2,427**	**1,108,000**	**416**	**183**	**599**	**1,850**

* Population for 2013 based on pro-rate estimate between 2011 and 2015 estimates from Region Planning
** YRT ridership based on YRT 10-year plan
*** YRTP fleet totals by YRT municipal areas are estimates

Table 5 (Detailed)
York Region Transit Vehicle Fleet Projection by Municipal Areas
2021, 2026, 2031

(Based on 2013 Population/Bus Ratios)

Municipality	2021					2026					2031				
	Population	Fleet Size				Population	Fleet Size				Population	Fleet Size			
		YRT	YRTP	**Total**	Pop./Bus		YRT	YRTP	**Total**	**Pop./Bus**		YRT	YRTP	Total	Pop./Bus
Aurora/Newmarket/ E. Gwillimbury/ Georgina/King	341,900	-	-	**115**	**2,968**	373,800	-	-	**126**	**2,968**	406,500	-	-	**137**	**2,968**
Markham/ Whitchurch-Stouffville	396,500	-	-	**200**	**1,983**	425,600	-	-	**215**	**1,983**	454,500	-	-	**229**	**1,983**
Richmond Hill	230,100	-	-	**173**	**1,330**	239,400	-	-	**180**	**1,330**	246,000	-	-	**185**	**1,330**
Vaughan	331,500	-	-	**210**	**1,582**	361,200	-	-	**228**	**1,582**	393,000	-	-	**248**	**1,582**
Total	**1,300,000**	**-**	**-**	**703**	**1,850**	**1,400,000**	**-**	**-**	**757**	**1,850**	**1,500,000**	**-**	**-**	**810**	**1,850**

*Totals do not agree due to averaging.

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Table 6
York Region Transit Vehicle Fleet Projection by Municipal Areas
2021, 2026, 2031

(Sensitivity Analysis – Effect of Urban Service Population/Bus Ratios)

Municipality	**2021**					**2026**					**2031**				
		Fleet Size					**Fleet Size**					**Fleet Size**			
	Population	YRT	YRTP	**Total**	Pop./Bus	**Population**	YRT	YRTP	**Total**	**Pop./Bus**	**Population**	YRT	YRTP	Total	Pop./Bus
Aurora/Newmarket/ E. Gwillimbury/ Georgina/King	314,900	-	-	**149**	**2,295**	373,800	-	-	**179**	**2,088**	406,500	-	-	**257**	**1,582**
Markham/ Whitchurch-Stouffville	396,500	-	-	**264**	**1,502**	425,600	-	-	**340**	**1,252**	454,500	-	-	**457**	**995**
Richmond Hill	230,100	-	-	**205**	**1,122**	239,400	-	-	**273**	**877**	246,000	-	-	**354**	**695**
Vaughan	331,500	-	-	**250**	**1,326**	361,200	-	-	**328**	**1,101**	393,000	-	-	**432**	**1,000**
Total	**1,300,000**	-	-	**867***	**1,500**	**1,400,000**	-	-	**1,120***	**1,250**	**1,500,000**	-	-	**1,500**	**1,000**

*Totals do not agree due to averaging.