

Memorandum

To: Rick Takagi, Ahmad Kidwai, John Greenough and Rajeev Roy

Copies: Don Gordon, Irene McNeil,

From: Paul Gooderham

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Subject: Proof-of-Payment Enforcement Staffing Working Calculations

Planning Information Assumptions

Peak Period Trip Times (min)	Round Trip	One Way
Finch/Newmarket	125	62.5
Finch/Richmond Hill	65	32.5
Highway 7	180	90
Vaughan NS	100	50
Markham NS	110	55
Finch/Markham	90	45
<i>Average Total Route Trip Times</i>	<i>111.67</i>	<i>55.83</i>

Fleet and Capacity Assumptions

Item	40' Buses	60' buses
Number in fleet	55	22
Number of spares	9	3
Number in peak service	46	19
Seats	37	54
Rated Passenger Capacity (x 1.33)	49	72
"Crush" Passenger Capacity	55-60	80-85

$$\text{Weighted Fleet Capacity} = (49 \times (55/(55+22))) + (72 \times (22/(55+22))) = 55.67$$

Peak Hour Assumptions

Service (6:00am to 12:00am)	Times	Estimated Share of Daily Ridership	% of the Day represented by each service period
3 hr AM peak	6:00am to 9:00am	35%	16.7%
7 hr Midday off-peak	9:00am to 4:00pm	20%	38.9%
3 hr PM peak	4:00pm to 7:00pm	35%	16.7%
5 hr Evening off-peak	7:00pm to 12:00am	10%	27.8%

Ridership Assumptions

Month	Monthly Ridership	Daily Ridership	Effective Annual Ridership
Sept 2005	220,000	7,333	2,676,667
Oct 2005	310,000	10,000	3,650,000
Nov 2005	360,000	12,000	4,380,000
Dec 2005	460,000	14,839	5,416,129
Jan 2006	550,000	17,742	6,475,806
Balance 2006		20,612 avg.	7,523,380

Enforcement Staff Productivity

Activity	No. Days per Enforcement Officer per Year	%	No. Days per Radio Dispatcher per Year	%
Active Work	206	79%	221	85%
Court Testimony	12		0	
Training	5		2	
Vacation	15		15	
Statutory Holidays	10		10	
Sickness	12		12	
<i>Total</i>	<i>260</i>	<i>100%</i>	<i>260</i>	<i>100%</i>

- Other non-productive activities:
 - o 1 hr unpaid meal break per shift
 - o 2 x 15 minute paid coffee breaks per shift
 - o 15 minute paid dress and undress time per shift
 - o 30 to 45 minute paid travel time per shift
- Result could be 6.5 and 8.5 hours of productive work per 8 and 10 hour shift respectively
- 60' buses assigned to Yonge corridor - 40' buses assigned to other corridors
- Saturday + Sunday boardings approximately equal number of boardings in one weekday
- Planned headways: Peak – 10 minutes Off-Peak – 15 minutes
- Whereas the average total one direction route trip time is 55.83 minutes, assume that the average trip taken by a passenger is three quarters of the route or 45 minutes.

Calculations:

- QuickStart will be operational 18 hrs a day 7 days a week or $18 \times 7 = 126$ hrs a week
- Applying the 79% productivity factor, YRT must plan to provide $126 / 0.79 = 160$ hrs a week of coverage to offset productivity losses
- If a team works for 40 hrs a week, this translates into a requirement to have 4 teams available in order to ensure that 1 team is providing enforcement inspections at all times. If 5 teams are available, then for 25% of the time, a second team will be working. If 6 teams are available, then for 50% of the time, a second team will be working. Of course, if YRT decides not to have enforcement teams in place whenever QuickStart is operating, it would be possible to double up coverage at other peak times.
- It is possible to arrange for some teams to work 10 hr shifts 4 days a week and others to work 8 hr shifts 5 days a week in order to permit the combination of an 8 hr and a 10 hr shift on any one day to provide continuous coverage over the 18 hrs of daily QuickStart operation.
- Assume that system will handle 2006 average annual ridership of 7.523M or 20,612 a day
- Assume 45 minute time for an average ride
- Assume 20 seconds required to inspect one ticket without citation
- Assume inspecting 5% of total system ridership - $20,612 \times 5\% = 1,031$ inspections a day
- Assume 65 buses in operation

Service	Ride %	Daily Riders	Rides per hr	Total Riders at any moment	Total Riders per bus at any moment	Avg. Total Riders to inspect per bus	Minutes Req'd to Inspect all Riders
3 hr AM peak	35%	7214	2405	1804	27.75	31	10.3
7 hr Midday off-peak	20%	4122	589	442	6.80	8	2.7
3 hr PM peak	35%	7214	2405	1804	27.75	31	10.3
5 hr Evening off-peak	10%	2061	412	309	4.76	6	2.0

- On a 10 hr shift, one team will be able to inspect 8 peak hour buses which will each have 31 riders on board and 40 off-peak hour buses which will each have 8 (midday) or 6 (evening) riders on board. This will mean that one team will be able to inspect $(31 \times 8) + (8 \times 23) = 432$ riders or $(31 \times 8) + (6 \times 17) = 350$ riders depending on whether they are assigned to the morning or afternoon shift. This equates to an average rate of 391 inspections per day per team. The worst case scenario would be that after alighting from a bus after inspecting every passenger's ticket, an enforcement team would have to wait 10 minutes at peak and 15 minutes off peak before the next bus arrives enabling them to board and commence new inspections.
- Given the requirement to inspect an average of 1,031 passengers per day, and assuming that one morning and one afternoon shift team is working every day inspecting between $(432 + 350) = 782$ tickets each day, an additional 249 tickets on the average will need to be inspected every day by a third team

- The following table factors in the ramp up of ridership during the early months.

Month	Daily Ridership	Req'd # of Inspections per day @ 5% Rate	Req'd # of Teams per day @ 390 Inspections per day	Req'd # Teams @ 4-10 hr shifts per week and 7 day weeks (x 7/4)	Req'd # Teams allowing for 79% Productivity of Teams (x 1/0.79)
Sept 2005	7,333	367	0.94	1.64	2.07
Oct 2005	10,000	500	1.28	2.24	2.82
Nov 2005	12,000	600	1.53	2.69	3.39
Dec 2005	14,839	742	1.90	3.32	4.19
Jan 2006	17,742	887	2.27	3.97	5.01
Balance 2006	20,612 avg	1031	2.64	4.61	5.82

- This translates into the following plan for the number of ticket inspection enforcement teams comprised of one Ticket Inspector ("TI") paired with one Special Constable ("SC").

Month	Calc'd # Req'd Teams	Planned # Teams	Planned # TIs on Teams	Planned # CSs on Teams	Planned # Emerg'cy SCs	Planned Total # SCs
Sept 2005	2	4	4	4	1	5
Oct 2005	3	4	4	4	1	5
Nov 2005	3	4	4	4	1	5
Dec 2005	4	4	4	4	1	5
Jan 2006	5	5	5	5	1	6
Balance 2006	6	6	6	6	1	7

- If YRT is required to train all 7 special constables at the same time, it may be preferable to minimize the number of Ticket Inspectors hired at the outset, having the Special Constables make up the majority of the initial enforcement team staffing and then gradually increase the number of Ticket Inspectors according to the following table:

Month	Planned # Teams	Planned # Emerg'cy SCs	Planned Total # CSs	Planned Total # TIs on Teams
Sept 2005	4	1	7	2
Oct 2005	4	1	7	2
Nov 2005	4	1	7	2
Dec 2005	4	1	7	2
Jan 2006	5	1	7	4
Balance 2006	6	1	7	6

- These Special Constables will need to be hired at least two months before Revenue Service to accommodate their anticipated two month training program.

The following table illustrates the fare evasion rates reported by Canadian transit operators during the POP Enforcement Best Practices Survey

Transit Operator	Reported Fare Evasion Rate
Toronto Transit Commission	2.4%
OC Transpo	1.5%
GO Transit	0.80%
Edmonton Transit	3.0%
Calgary transit	1.5%
<i>Canadian Weighted Average</i>	<i>2.10%</i>

- Applying this weighted average fare evasion rate to the 1031 tickets that will be inspected every day, and assuming that a citation or summons is issued for every infraction, YRT can expect to issue $(1031 \times 2.10\% = 21.65)$ 22 citations or summons each day.
- If we assume that it will take an average of 5 minutes to issue a ticket or summons, this will take $22 \times 5 = 110$ minutes per day in excess of the time required to inspect tickets. This translates into an additional time of $(110 / (2.64/0.79) = 33.1$ minutes per team per day or approximately 6% of a 10 hr shift. It is assumed that this time can be absorbed by the ability of an inspector to inspect a ticket in less than 20 seconds per ticket and by the low ridership and fewer inspections required during off-peak periods.
- If we assume that 1.5% of citations will become a problem that will escalate to involve the police then 2.3 escalations per week will be made (or 120 per year). If the team is busy with the escalated situation for one hour then each officer will miss an average of 59 inspections per day.

Transit Operator	Average Fine for First Offense
Toronto Transit Commission	\$115
OC Transpo	\$85
GO Transit	\$90
Edmonton Transit	\$110
Calgary Transit	\$150
Vancouver TransLink	\$46
<i>Canadian Weighted Average</i>	<i>\$105</i>

- **At an average first offense fine of \$105, the 22 daily citations will generate a daily revenue of $(\$105 \times 22) = \$2,310$ or an annual revenue of $(\$2,310 \times 365) = \$843,150$. If it is assumed that 80% of these fines will be collected through civil collection procedures, the annual revenue from fines will be approximately \$674,520.**

- It is also assumed that compliant passengers that will provide tickets or accept citations without challenge. Clearly, if passengers are not compliant, then escalated enforcement procedures will come into effect and the inspection schedule of an inspection team will be affected.
- To deal with these escalated enforcement situations, an additional special constable in an enforcement vehicle will be available at critical periods to be called in for emergency backup to assist the special constable on the BRT. The backup special constable will require one vehicle to travel to the incident location with one vehicle in spare.
- It is assumed that there will be one YRT Enforcement Supervisor hired to manage the day-to-day activities of the enforcement officer teams who will be on call for emergencies when not on duty.
- It is assumed that the enforcement teams will each have a PDA/phone that will have a list of all previous offenders. The phone will be used to call for backup or YRPD assistance. Radios will be provided for emergency requests. The radio will be manned by the O&M contractor.
- There will be a database analyst to analyze the infraction data and to prepare the court documents and responses.
- An existing YRT manager will assume responsibility for the POP enforcement activities

Monthly Enforcement Budgets

July 2005		Training				
Position	# FTEs	Wage	Burden %	Annual Total	Comment	
Ticket Inspector	0	\$ 21.90	30%	\$ -		
Special Constable	6	\$ 30.92	30%	\$ 443,764	8 Special Constables on Training	
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961		
Supervisor	1	\$ 64,793	25%	\$ 80,991		
Radio Dispatcher/Data Analyst	0	\$ 21.68	30%	\$ -		
Enforcement Manager	0.1	\$ 80,000	25%	\$ 10,000		
YRPD Backup	1	\$ -		\$ -		
Contingency	15%			91,307.36		

Total Annualized Operating Costs	\$ 700,023
Total Monthly Costs	\$ 58,335

Initial Capital Costs	#	Cost per unit	Total
Cruising Enforcement Vehicles	0	\$ 40,000	\$ -
PDA	0	\$ 1,000	\$ -
PDA Customisation	0	\$ 10,000	\$ -
Radios for each TI & SC team	0	\$ 2,000	\$ -
Radio Base Station	0	\$ 60,000	\$ -
Contingency	20%		\$ -
Total Capital Costs			\$ -

Aug-05		Training				
Position	# FTEs	Wage	Burden %	Annual Total	Comment	
Ticket Inspector	2	\$ 21.90	30%	\$ 104,770	2 Ticket Inspector on Training	
Special Constable	6	\$ 30.92	30%	\$ 443,764	7 Special Constable on Training	
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961		
Supervisor	1	\$ 64,793	25%	\$ 80,991	1 Supervisor on Training	
Radio Dispatcher/Data Analyst	0	\$ 21.68	30%	\$ -		
Enforcement Manager	0.1	\$ 80,000	25%	\$ 10,000	Part time other YRT Manager	
YRPD Backup	1	\$ -		\$ -		
Contingency	15%			107,022.80		

Total Annualized Operating Costs	\$ 820,508
Total Monthly Costs	\$ 68,376

Incremental Capital Costs	#	Cost per unit	Total	
Cruising Enforcement Vehicles	2	\$ 40,000	\$ 80,000	c/w radios
PDA	9	\$ 1,000	\$ 9,000	
PDA Customisation	1	\$ 10,000	\$ 10,000	
Radios for each TI & SC team	9	\$ 2,000	\$ 18,000	
Radio Base Station	1	\$ 60,000	\$ 60,000	
Contingency	20%		\$ 35,400	
Total Capital Costs			\$ 212,400	

Sept to Dec 2005		Ramp Up		4 Teams		
Position	# FTEs	Wage	Burden %	Annual Total	Comment	
Ticket Inspector	2	\$ 21.90	30%	\$ 104,770	2 Team of TI & SC	
Special Constable	6	\$ 30.92	30%	\$ 443,764	2 Teams of Double SC	
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961	1 Cruising emergency backup SC	
Supervisor	1	\$ 64,793	25%	\$ 80,991		
Radio Dispatcher/Data Analyst	1	\$ 21.68	30%	\$ 51,859		
Enforcement Manager	0.1	\$ 80,000	25%	\$ 10,000	Part time other YRT Manager	
YRPD Backup	1	\$ -		\$ -		
Contingency	15%			114,801.58		
Total Annualized Operating Costs				\$ 880,145		
Total Monthly Costs				\$ 73,345		
Incremental Capital Costs	#	Cost per unit		Total		
Cruising Enforcement Vehicles	0	\$ 40,000		\$ -		
PDA	0	\$ 1,000		\$ -		
PDA Customisation	0	\$ 10,000		\$ -		
Radios for each TI & SC team	0	\$ 2,000		\$ -		
Radio Base Station	0	\$ 60,000		\$ -		
Contingency	20%			\$ -		
Total Incremental Capital Costs				\$ -		
Jan-06		Revenue Service		5 Teams		
Position	# FTEs	Wage	Burden %	Annual Total	Comment	
Ticket Inspector	4	\$ 21.90	30%	\$ 209,539	4 Teams of TI & SC	
Special Constable	6	\$ 30.92	30%	\$ 443,764	1 team of double SC	
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961	1 Cruising Emergency Backup SC	
Supervisor	1	\$ 64,793	25%	\$ 80,991		
Radio Dispatcher/Data Analyst	1	\$ 21.68	30%	\$ 51,859		
Enforcement Manager	0.1	\$ 80,000	25%	\$ 10,000	Part time other YRT Manager	
YRPD Backup	1	\$ -		\$ -		
Contingency	15%			130,517.02		
Total Annualized Operating Costs				\$ 1,000,631	Annualized total based on 2006 rideship	
Total Monthly Cost				\$ 83,386		
Incremental Capital Costs	#	Cost per unit		Total		
Cruising Enforcement Vehicles	0	\$ 40,000		\$ -		
PDA	2	\$ 1,000		\$ 2,000		
PDA Customisation	0	\$ 10,000		\$ -		
Radios for each TI & SC team	2	\$ 2,000		\$ 4,000		
Radio Base Station	0	\$ 10,000		\$ -		
Contingency	20%			\$ 1,200		
Total Incremental Capital Costs				\$ 7,200		

Balance of 2006		Revenue Service		6 Teams		
Position	# FTEs	Wage	Burden %	Annual Total		Comment
Ticket Inspector	6	\$ 21.90	30%	\$ 314,309		6 Teams of TI & SC
Special Constable	6	\$ 30.92	30%	\$ 443,764		6 Teams of TI & SC
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961		1 Cruising Emergency Backup SC
Supervisor	1	\$ 64,793	25%	\$ 80,991		
Radio Dispatcher/Data Analyst	1	\$ 21.68	30%	\$ 51,859		
Enforcement Manager	0.1	\$ 80,000	25%	\$ 10,000		Part time other YRT Manager
TRPD Backup	1	\$ -		\$ -		
Contingency	15%			146,232.46		
Total Annualized Operating Costs				\$ 1,121,116	Annualized total based on 2006 rideship	
Total Monthly Cost				\$ 93,426		
Incremental Capital Costs	#	Cost per unit		Total		
Cruising Enforcement Vehicles	0	\$ 40,000		\$ -		
PDA	2	\$ 1,000		\$ 2,000		
PDA Customisation	0	\$ 10,000		\$ -		
Radios for each TI & SC team	2	\$ 2,000		\$ 4,000		
Radio Base Station	0	\$ 10,000		\$ -		
Contingency	20%			\$ 1,200		
Total Incremental Capital Costs				\$ 7,200		

Annual Enforcement Budget

FY 2006		Revenue Service		6 Teams	
Position	# FTEs	Wage	Burden %	Annual Total	Comment
Ticket Inspector	6	\$ 21.90	30%	\$ 314,309	6 Teams of TI & SC
Special Constable	6	\$ 30.92	30%	\$ 443,764	6 Teams of TI & SC
Special Constable Backup	1	\$ 30.92	30%	\$ 73,961	1 Cruising emergency backup SC
Supervisor	1	\$ 64,793.00	25%	\$ 80,991	
Radio Dispatcher/Data Analyst	1	\$ 21.68	30%	\$ 51,859	
Enforcement Manager	0.1	\$ 80,000.00	25%	\$ 10,000	Part time other YRT Manager
YRPD Backup	1	\$ -		\$ -	
Contingency	15%			\$ 146,232	
Total Annualized Operating Costs				\$ 1,121,116	
Revenue from Fines				\$ 674,520	
Net Operating Expense				\$ 446,596	

Note that the following items have not been included as capital or operating items in the budget:

- PDA connection charges
- Uniforms
- Gas and maintenance of vehicles
- Development and printing of citation forms
- Licence and maintenance of database software

It is also possible that YRPD may require YRT to pay a fee for providing emergency backup capability. A line item "YRPD Backup" has been provided but no allowance has been made.