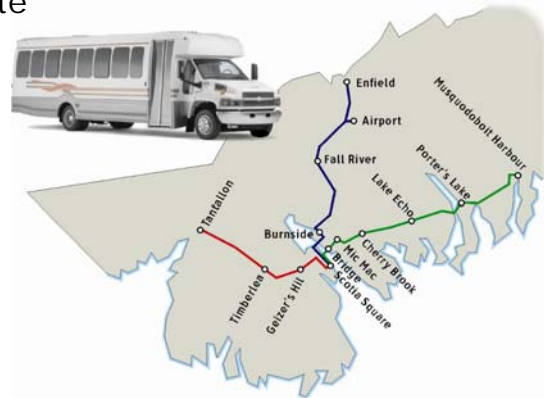


Rural Express Transit

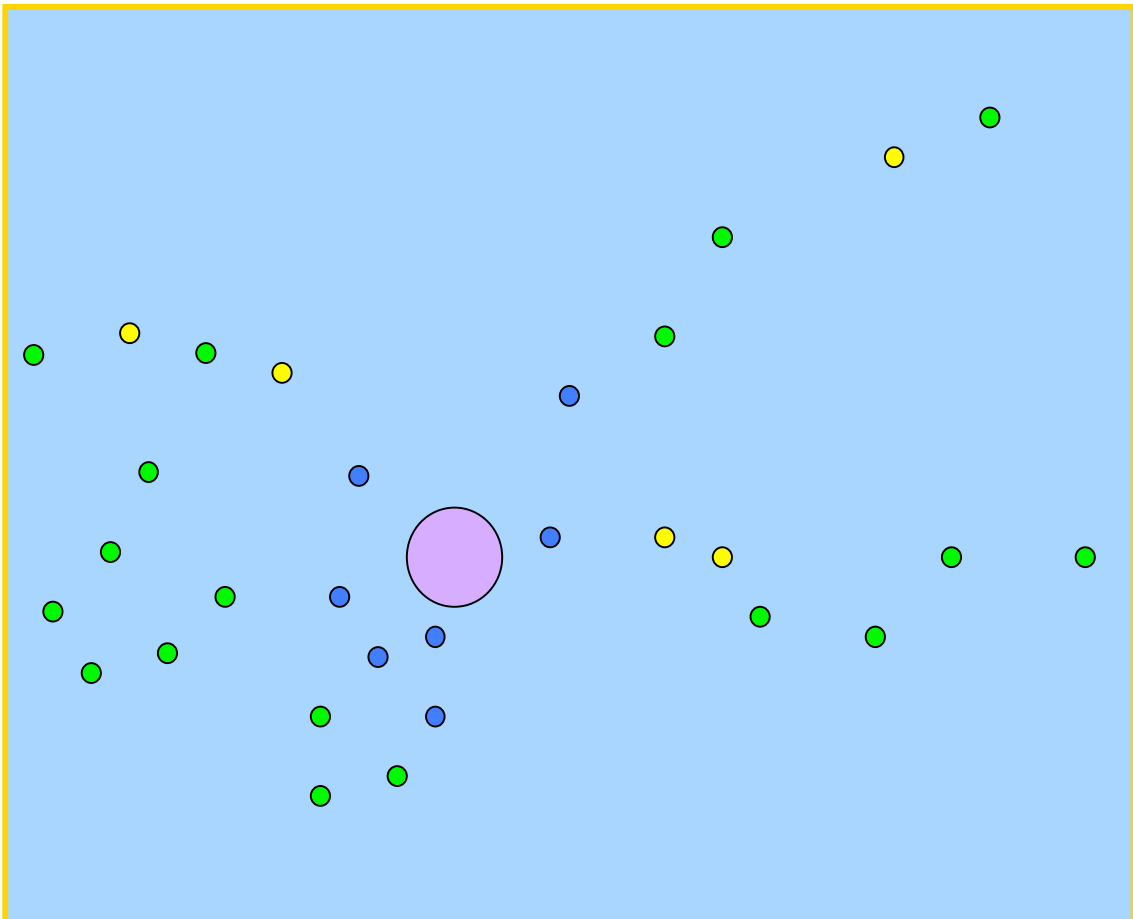
- Highway Buses
- Park-and-Ride at Interchanges
- General Tax Rate



Rural Transit Planning Guidelines

Users' Guide

February 2008



Prepared for the Halifax Regional Municipality by ENTRA Consultants

Step 1 – Who will use this service?

Community population allocations for 2006 have been provided by the HRM, and are based on the latest census data available. In addition to these estimates, estimates have been provided for 2006 based on these allocations. Communities will require a service that can grow to accommodate these ridership estimates, which are found in Exhibit 5. Calculations will apply data from CUTA community utilization factors to ridership projections.

Worksheet Instructions

Use Worksheet 1 to calculate the ridership anticipated for this service for the year of implementation.

Exhibit 5 – HRM Population Allocations (based on 2001 Census)

Location	2010 Population
Airport	1145
Bedford West (Atlantic Acres)	3038
Bissett Road	301
Cow Bay	4502
E. Chezzetcook	1021
Elmsdale & environs within HRM	1844
Enfield (HRM portion only)	1267
Fall River &	4882
Hatchet Lake	2486
Hubbards (incl. Queensland)	1523
Hubley	1418
Indian Harbour (incl. Peggys Cove)	2034
Jacks Lake	170
Jeddore (incl western end of Musquodoboit Hbr. and Gaetz Brook)	969
Kearney Lake North (incl. Kingswood E.)	3896
Ketch Harbour	1110
Kingswood-St. Georges	2445
Lake Charlotte and Tangier (incl. Ship Harbour)	1678
Lake Echo	3512
Lake Fletcher	3128
Lawrencetown	1248
Mid. Beaver Bank	2611
Middle Musquodoboit	2504
Minesville	736
Moser River	958
Musquodoboit Hbr.	4064
North Preston	1951
Pockwock	5200
Porters Lake E.	3613
Porters Lake S.	1223
Porters Lake W.	1601
Rocky Lake Road	555
Ross Road	861
Sambro (incl. Harrietsfield)	3049
Seabright	2114
Seaforth	1073
Sheet Harbour	2042
South of Lucasville	254
Upper Beaver Bank	1357
Upper Musquodoboit	1054
Upper Sackville	2792
Upper Tantallon	2831
Upper-West Lawrencetown	2533
Waverley (incl. Montague)	2197
West of Hubley (incl. Lewis Lake)	2563
Westphal (Humber Park) plus East Preston- Cherry Brook Loon Lake	2455

Estimate of 2010 population allocation by ENTRA Consultants. Dec 2/07.

HRM 2001 POPULATION COUNT AND 2026 REGIONAL PLAN POPULATION ALLOCATION, HRM Planning Dept, Nov 1/07.

Step 2 - Where do people in my community want to travel?

Transit services should be created to bring people to and from transit-supportive land uses. Examples of land uses that are likely to generate a higher degree of transit use are presented in Exhibit 6.

To estimate the degree of transit use for common trip generators, tables have been provided based on peak travel time rates established by the Institute of Transportation Engineers (ITE). Exhibit 7 presents resident trip generation to land uses within your community and Exhibit 8 presents trip generation from your community to a land use located outside the community. These rates have been derived from traffic data with assumptions made regarding the transit mode split anticipated for implementation and full service design with considerations regarding travel inside and outside the community.

This table has been provided as a qualitative guide to establish the main transit trip generators. To use the table, select a land use type in the first column, and then identify the approximate number of units that are within this use. Tracing the row from here, the total number of passengers picked up and dropped off (two-way ridership) is estimated for the peak transit service times in the weekday AM and PM. Industry standard weekday peak traffic and transit times are considered to be 7:00a.m. to 9:00a.m. and 4:00p.m. to 6:00p.m. Saturday peak times are between 11:00a.m. and 1:00p.m.

For example, for the implementation stage of transit service within your community, there is a shopping centre with a pharmacy and a grocery store, with an approximate leasable floor area of 150,000 square feet. This will generate an estimated five two-way trips per hour in the weekday AM peak period and 17 trips per hour in the PM peak period. Saturdays are typically busier for shopping trips with an estimated 23 two-way trips to be generated. At the mature stage of transit service design, there will be twice as many trips generated for each of the time periods. A shopping centre that is outside your community will need to be substantially larger to generate the same number of transit trips due to the longer travel times.

Worksheet Instructions

On Worksheet 2, create a list of 10 places that you see as the most prominent trip generators. These will form the main origins and destinations for the service.

Exhibit 7 – Transit Trip Generation Estimates (within Community)

	Units	Implementation		Mature	
		am 2 Way	pm 2 Way	am 2 Way	pm 2 Way
Park and ride lots	35	0	0	3	1
# of Occupied Spaces	75	1	0	4	3
	100	1	1	6	4
	125	1	1	7	5
	150	2	1	10	6
Industrial areas	100	0	0	2	2
# of Employees	200	1	1	5	5
	300	1	1	7	7
	400	2	1	9	9
	500	2	2	12	11
Hospitals	50	0	0	3	3
# of Beds	100	1	1	6	6
	150	2	2	9	10
	200	3	3	11	13
	250	3	3	14	16
Office Building	50	0	0	1	1
# of Employees	100	0	0	2	2
	150	2	0	3	4
	200	2	0	5	5
	250	2	0	6	6
Shopping Centre - Weekday					
Sq ft of Gross Leasable Area	50000	0	2	3	10
Grocery Store	100000	2	4	5	19
Department Store	150000	2	6	8	29
	200000	2	8	10	38
Local Mall	250000	4	10	13	47
Shopping Centre - Saturday					
Sq ft of Gross Leasable Area					
grocery Store	50000	2	-	12	-
	100000	5	-	25	-
Department Store	150000	8	-	37	-
	200000	10	-	50	-
Local Mall	250000	12	-	62	-
Residential	10	0	0	0	0
Number of Dwellings	20	0	0	1	1
	30	0	0	1	2
	40	0	0	1	2
	50	0	0	1	3

Based on institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Ed.

Exhibit 8 – Transit Trip Generation Estimates (Outside Community)

	Units	Implementation		Mature	
		am 2 Way	pm 2 Way	am 2 Way	pm 2 Way
Park and ride lots	35	0	0	3	1
# of Occupied Spaces	75	1	0	4	3
	100	1	1	6	4
	125	1	1	7	5
	150	2	1	10	6
Industrial areas	100	0	0	2	2
# of Employees	200	1	1	5	5
	300	1	1	7	7
	400	2	1	9	9
	500	2	2	12	11
Hospitals	50	0	0	3	3
# of Beds	100	1	1	6	6
	150	2	2	9	10
	200	3	3	11	13
	250	3	3	14	16
Office Building	50	0	0	1	1
# of Employees	100	0	0	2	2
	150	2	0	3	4
	200	2	0	5	5
	250	2	0	6	6
Shopping Centre - Weekday					
Sq ft of Gross Leasable Area	50000	0	2	3	10
Grocery Store	100000	2	4	5	19
Department Store	150000	2	6	8	29
	200000	2	8	10	38
Local Mall	250000	4	10	13	47
Shopping Centre - Saturday					
Sq ft of Gross Leasable Area					
Grocery Store	50000	2	-	12	-
	100000	5	-	25	-
Department Store	150000	8	-	37	-
	200000	10	-	50	-
Local Mall	250000	12	-	62	-
Residential	10	0	0	0	0
Number of Dwellings	20	0	0	1	1
	30	0	0	1	2
	40	0	0	1	2
	50	0	0	1	3

Based on Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Ed.

Step 3 – What type and level of service would best serve my community?

There are a number of fixed and flexible service design options that may be appropriate to present transit as a viable transportation option, meeting the needs of various communities. These services options are further detailed in case studies presented as Appendix 2.

The type of service will depend on how many people want to travel and when, and where they want to go. Step 1 and Step 2 identified how many people will want to travel, and where they want to go. In this step, the objective is to determine how best to accomplish this.

Conventional Transit Services

Conventional transit services are generally those transit services that follow a set timetable (fixed schedule) and may follow a fixed route, stopping at designated locations, or at flag stops along routes.

Fixed route/fixed schedule services require the highest ridership levels to support, since they have the least flexibility. Dynamic routes, those with a fixed schedule but the ability to operate anywhere in a zone (sometimes called a zone bus) require less ridership, since they are more flexible.

Demand Responsive Services

Demand responsive services allow flexibility for vehicles to be routed according to passenger origin and destination requests and are adaptable for different areas or times. Trips can be scheduled as subscription (regularly occurring trips), advance notice (typically two to fourteen days in advance), or through real time booking (typically the day of service). Day of service booking allows for immediate needs, and services should be optimized in terms of share-riding.

Flexible routes are routes that have a defined degree of deviation to allow flexibility for demand responsive operation. There may be a segment of a fixed route with a fixed schedule that operates as demand responsive for a portion of the route. Flexible service can be designed to offer deviation zones around established routes or points. Connectors may operate as demand responsive within a defined area having transfer points along fixed routes.

A flexible schedule service is where vehicles are dispatched according to requested passenger pick-up and drop-off times.

Service may be limited to defined zones by time of day or day of week, with boundaries and major origins and destinations based upon historical or predicted trip making. Zone service is best used for short trip distances to a common

destination. Zone service may be transformed to a fixed route service if demand and trip patterns warrant.

Innovative Services

Alternative services can be implemented as a form of additional revenue for transit service providers.

- commuter bus service
- parcel bus
- formal volunteer program
- shuttle services for community employers
- transit services targeted to grocery stores
- public-private partnerships
- school buses used to provide public transit
- selling bus seats to employers
- centralized brokerage
- combined funding streams with non-revenue municipal fleet

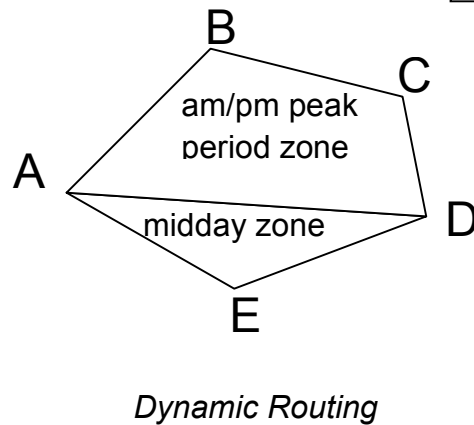
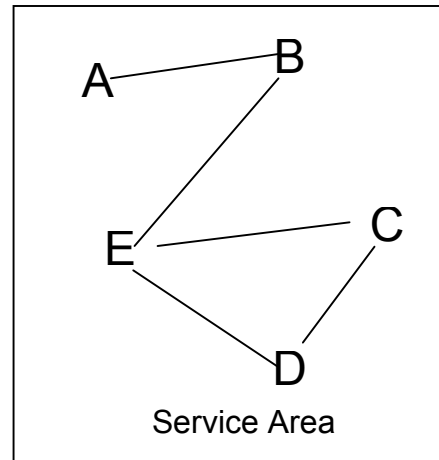
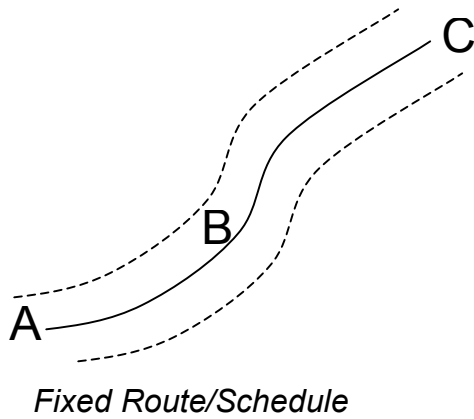
Use Exhibit 9 to determine the range of services that may be best for your community.

Use your total ridership from Step 1 and your transit trip generators from Step 2 to guide you through this process. Depending on the nature of the trips, including when and where they occur, you may decide to have different services in different areas, or at different times of the day.

For example, if you estimate that more than 70 potential riders are within a short walk of a route, but will only travel in the peaks, then you might consider a fixed route service in peak periods. Then, if there is additional ridership outside of the peaks, but at low levels, you might consider a demand response service for the rest of the day.

Exhibit 9 – Range of Service Options

Route Type	Service area	Rides Required	
		All Day Service	Peak Hour Service
Fixed Route/Schedule	Within walking distance of route	More than 100 all day	More than 70 in peak period
Dynamic Routing	Within larger service zone	More than 100 all day	More than 70 in peak period
Demand Response	Within full service area	Fewer than 100 all day	Fewer than 70 in peak period



Demand Response

Step 4 - What vehicle type is most appropriate for my community?

Vehicles used for public transit have been categorized in three groups:

- minivans
- small bus
- big bus

The size of vehicle required depends on how many passengers will need to be accommodated at one time, or on one trip.

Exhibit 10 illustrates sample vehicles in these categories with specifications provided regarding the make, model, price, capacity and maximum age.

To determine the size of vehicle required, follow these steps:

For fixed routes:

- How many passengers will be carried on each route, either all day, or during the peaks (Use Step 2 and Exhibit 9)?
- How many trips will the bus make on the route? If you came up with an answer in Step 3, use that, otherwise, for peak periods, assume five trips in the morning and six in the afternoon. For the rest of the day, assume five or six trips.
- Divide the number of passengers by the number of trips, and you'll have the maximum number of passengers to be accommodated. To allow for peak travel variations, add 50 percent to this number. Compare this number to the capacity of the vehicles in Exhibit 10 to determine the appropriate vehicles.

For demand response services:

- Consider a minivan, or small bus, or combination, if more than one vehicle is required.

Exhibit 10 - Sample Vehicles and Relevant Specifications

	Minivan	Small Bus	Big Bus
			
<i>Make</i>	Dodge ¹	Turtle Top ²	Turtle Top ²
<i>Model</i>	Sprinter	Odyssey	Odyssey XL
<i>Price (New)</i>	\$60,000 - \$80,000	\$125,000 - \$145,000	\$155,000 - \$175,00
<i>Capacity⁴</i>	10	24	37
<i>Max. Age⁵</i>	4	8	8
			
<i>Make</i>	GM/Chrysler/Ford Conversion ³	EIDorado ²	EIDorado ²
<i>Model</i>	Varies	Aerolite	Aero Elite
<i>Price (New)</i>	\$60,000 - \$80,000	\$125,000 - \$145,000	\$155,000 - \$175,00
<i>Capacity⁴</i>	3	13	33
<i>Max. Age⁵</i>	4	8	8

- Source:
- 1 Dodge Canada
 - 2 Crestline Coach
 - 3 Lucanus Crporation
 - 4 Based upon configuration to accommodate mobility device(s)
 - 5 Vehicles may be refurbished beyond the maximum age to extend years of service

Step 5 - What are the capital costs for this service?

Components of capital costs for service implementation:

- bus stops and passenger amenities
- vehicle purchases and refurbishments
- land and buildings (including bus shelters)
- rights-of-way
- computer and other automation equipment
- non-vehicle capital purchase, such as fare boxes, shop equipment, office equipment
- costs for auxiliary passenger service, such as charter service.

To calculate these costs in detail is beyond the scope of these guidelines, so a contingency has been noted in the worksheets to offer an approximate allocation. However, some detail has been provided for the location of bus stops and the passenger amenities required at each type.

Background materials on the placement of bus stops by type is presented in Exhibit 11. Exhibit 12 lists the required passenger amenities by bus stop type, with an overall cost by stop type. Components of passenger amenities are catalogued as Exhibit 13. Exhibit 14 to Exhibit 17 illustrate a typical layout for passenger amenities at bus stops.

Worksheet Instructions

Complete Worksheet 5, which combines the costs for vehicles, bus stops and passenger amenities with a contingency for the remaining capital cost components.

Exhibit 11 ~ Warrants for Bus Stop Levels of Amenities

Activity	Justification	Points
High Boarding / Transfer Location	Local Road	1
	Connector	2
	Arterial / Avenue	10
Mobility Needs Location	Seniors' group home, medical clinics, libraries, hospital, shopping malls and hospitals.	7
Activity Location	Apartment, secondary and post secondary schools.	3
Request	Request from Public	2

Route end points warrant the implementation of **Transit Terminals**.

Greater than 10 points warrants the implementation of a **Major Stop**.

Greater than five points warrants the implementation of an **Accessible Stop**.

500 metre bus stop spacing warrants the implementation of a **Minor Stop**.

Exhibit 12 – Transit Amenities by Bus Stop Type

Amenity	Minor Stop	Accessible	Major Stop	Terminal
Route Sign and Post	Standard	Standard	Standard	Standard
Seating	Optional	Standard	Standard	Standard
Shelter	Optional	Optional	Standard	Standard
Route Schedule/Map	Standard	Standard	Standard	Standard
System Map	Optional	Optional	Standard	Standard
Waste Receptacle	Optional	Optional	Standard	Standard
Off –Road Bus Bays	Optional	Optional	Optional	Standard
Park and Ride	Optional	Optional	Optional	Standard
Kiss and Ride	Optional	Optional	Optional	Standard
Shelter Pads	Optional	Standard	Standard	Standard
Lighting	Optional	Optional	Standard	Standard
Newspaper Boxes	Optional	Optional	Optional	Standard
Power Pedestal	Optional	Optional	Standard	Standard
Bicycle Rack	Optional	Optional	Standard	Standard
Minimum Cost	\$1,000	\$5,000	\$10,000	\$15,000

Calculation of costs for bus stops and passenger amenities:

Given the following assumptions:

- average bus stop spacing = 500 metres
- average bus speed = 20 km/hour (HRM average bus speed, CUTA 2005)
- average route length = one hour (time for full circuit of route to be completed)

Based on these factors, it can be assumed that each unique hour long route will require 40 bus stops. Of these 40 bus stops approximately:

- one will be a terminal bus stop
- one will be a major bus stop
- three will be accessible bus stops serving mobility needs locations
- the remaining 35 stops will be minor bus stops.

This can be summarized as follows:

Stop Type	Unit Cost	Quantity	Total Cost
<i>Terminal stop</i>	\$15,000	x 1	= \$15,000
<i>Major bus stop</i>	\$10,000	X 1	= \$10,000
<i>Accessible bus stop</i>	\$5,000	X 3	= \$15,000
<i>Minor bus stop</i>	\$1,000	X 35	= \$35,000
PASSENGER AMENITY IMPLEMENTATION COSTS			= \$75,000

Therefore, the implementation capital cost for bus stop passenger amenities for a one-hour route can be estimated at \$75,000 per route.

Exhibit 13 - Sample Amenities and Pricing

www.theparkcatalog.com













Amenity	Sample (with Approximate Costs)		
<p><i>Seating</i></p>	 <p>Wood Bench \$250</p>	 <p>Wood Bench \$450</p>	 <p>Aluminum Bench \$550</p>
<p><i>Sign</i> <i>(Includes Installation and Foundation)</i></p>	 <p>Sign and Post \$500</p>	 <p>Sign, Post and Route Schedule \$750</p>	 <p>Sign, Post, Route Schedule and System Map \$1250</p>
<p><i>Bicycle Rack</i></p>	 <p>U-Style \$100</p>	 <p>Wave Rack \$250</p>	 <p>Grid Rack \$350</p>
<p><i>Waste Receptacle</i></p>	 <p>58 Gal - Plastic \$450</p>	 <p>40 Gal-PermaWood \$550</p>	 <p>32 Gal - Animal Resistant \$550</p>

Exhibit 14 - Transit Terminal Layout

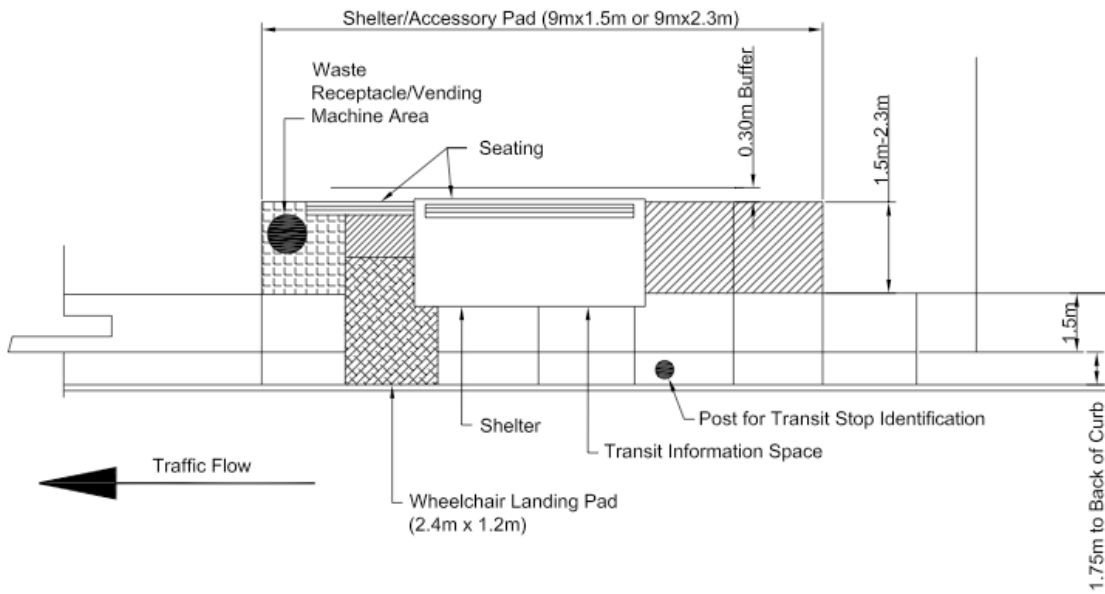
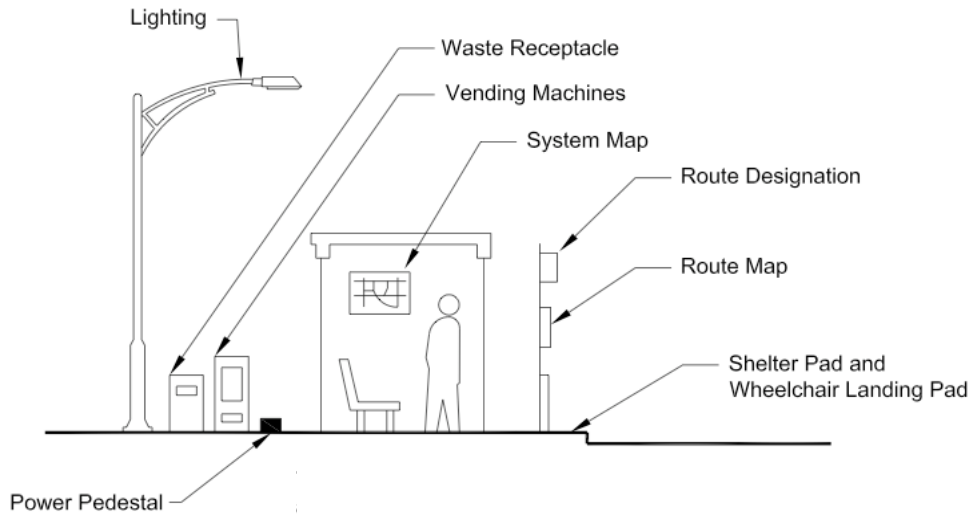


Exhibit 15 - Major Stop Layout

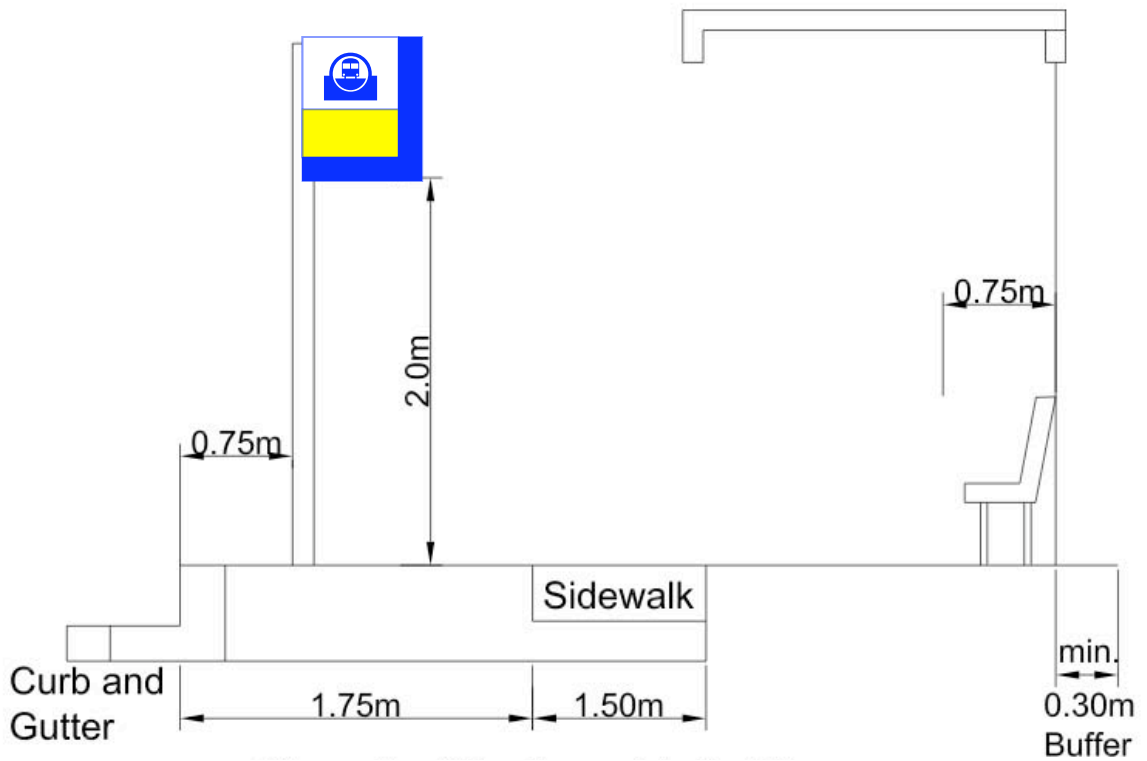
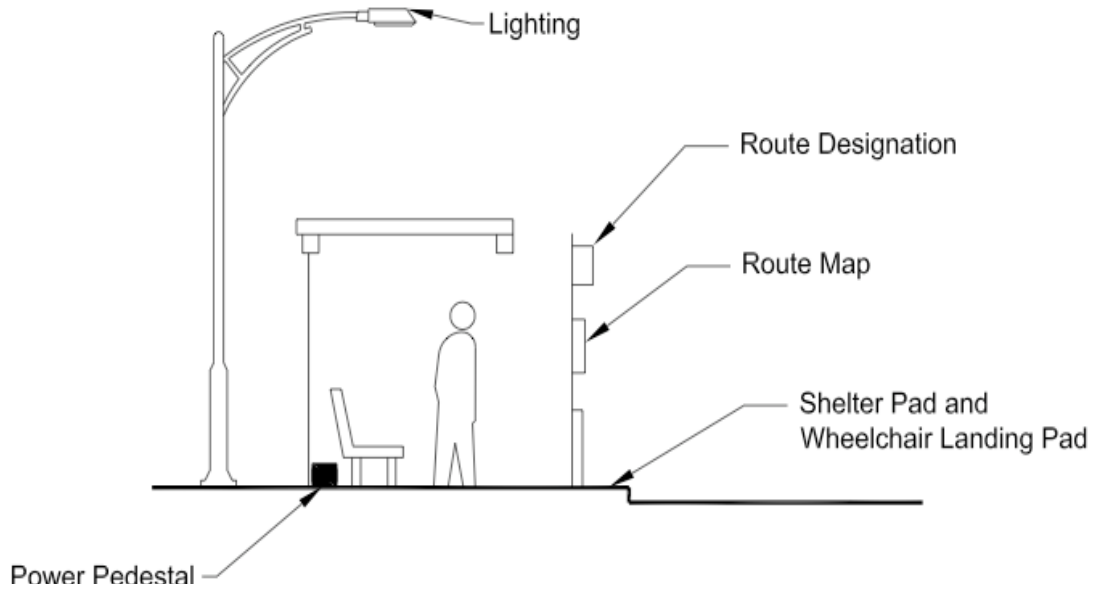


Exhibit 16 - Accessible Stop Layout

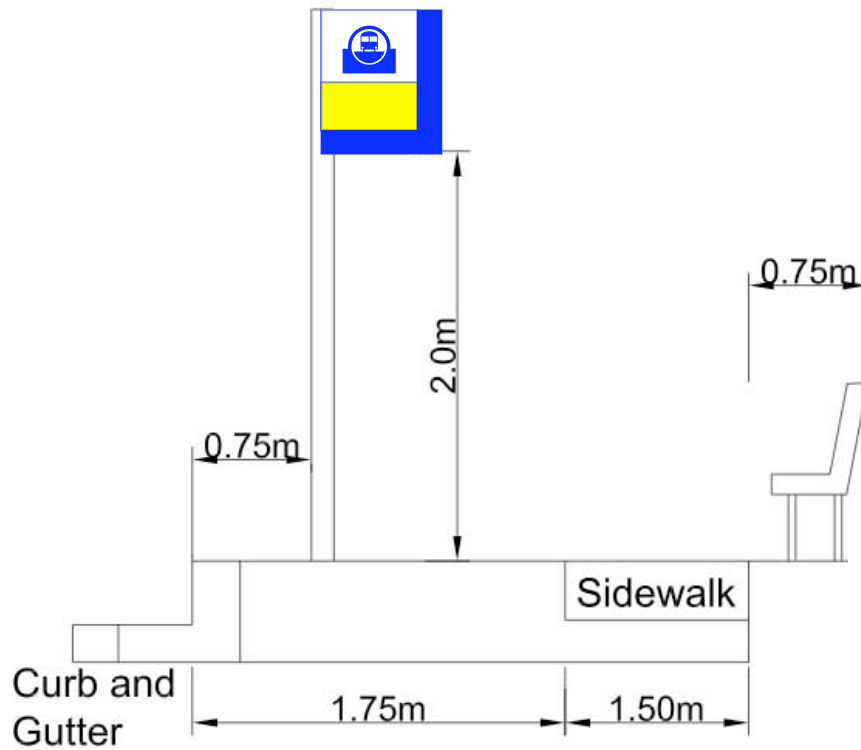
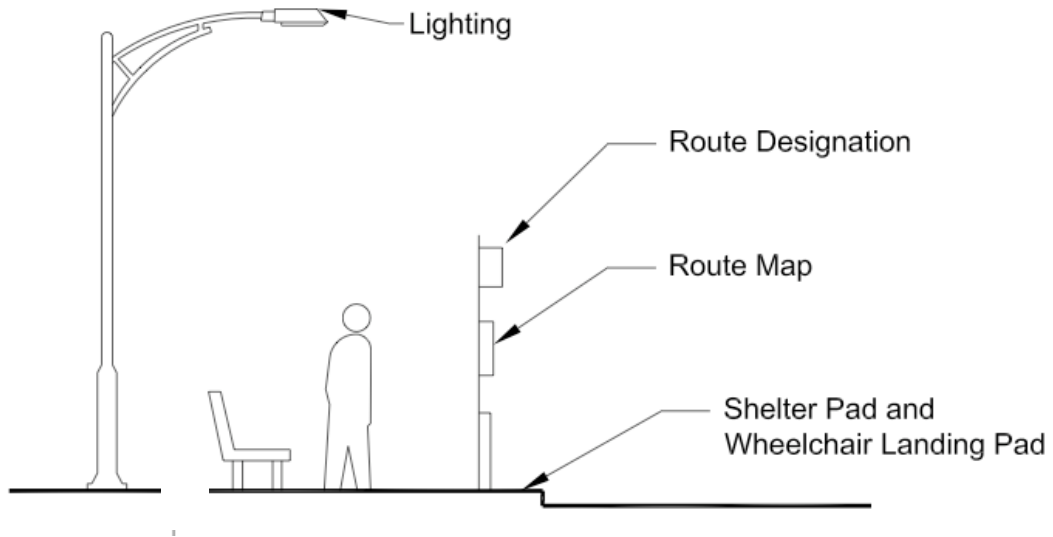
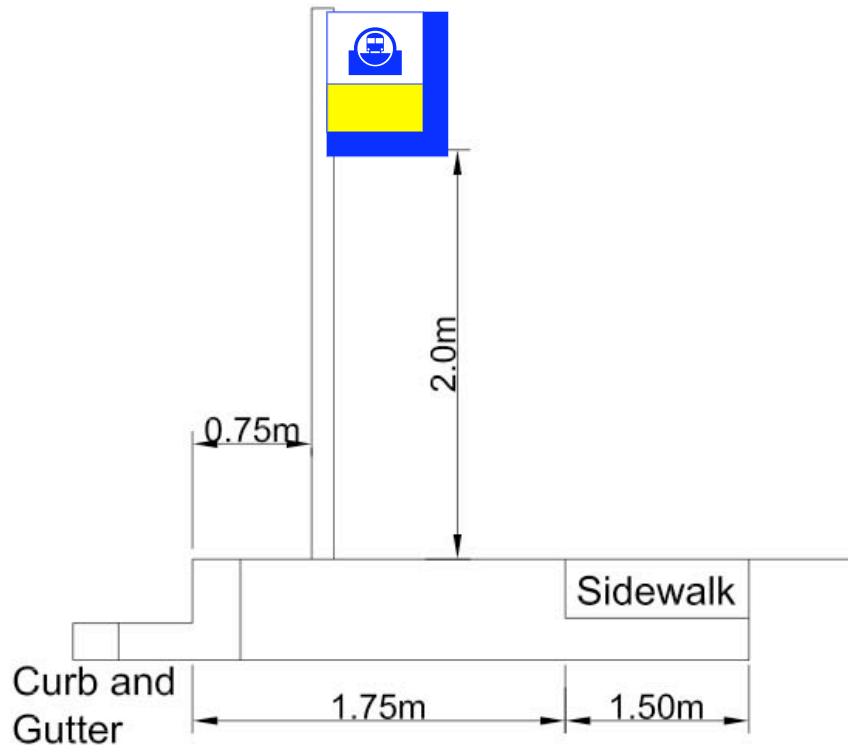
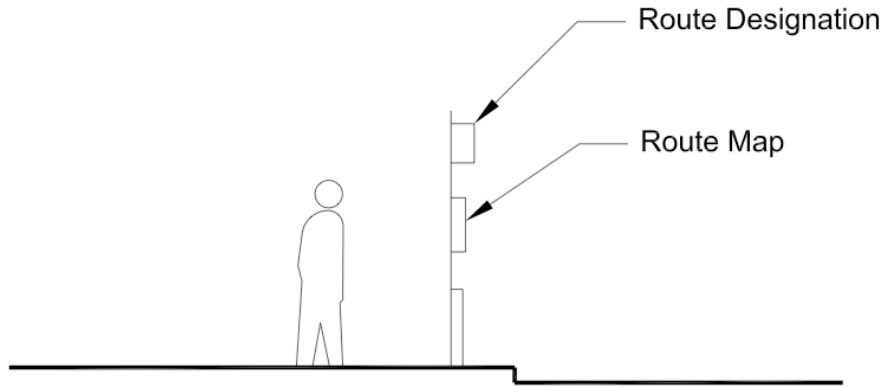


Exhibit 17 - Minor Stop Layout



Step 6 - What are the annual operating costs for this service?

Components of total direct operating expenses:

1. Transportation Operations Expenses
 - salaries, wages and benefits (for operators, inspectors, dispatchers, schedulers, management)
 - uniforms
 - vehicle licenses, registration and insurance premiums,
 - purchased services
2. Fuel/Energy Expenses for Revenue Vehicles
 - Total expense fuel/energy for revenue vehicles
3. Vehicle Maintenance Expenses
 - salaries, wages and benefits (for mechanics, servicemen, foremen, management)
 - parts, materials and supplies
 - purchased services
4. Plant Maintenance Expenses
 - salaries, wages and benefits (for security, janitorial, tradesmen, management)
 - utilities
 - parts, materials, and supplies
 - purchased services
 - shelter maintenance
 - municipal or property tax
5. General and Administration Expenses
 - Other direct operating costs, including salaries, wages and benefits (for general manager's office, planning, marketing, human resources, finance)
 - Liability expenses (other than fleet insurance premiums)
 - Advertising, promotion, office supplies, telephone

Step 7 – Budget Summary

Exhibit 18 illustrates the Metro Transit fare structure as of January 2007. Under this structure the average fares translate into approximately \$1.50 per passenger (which includes passenger transfers).

This fare structure is categorized by adult, senior, child and student groups, and includes cash, tickets, passes and transfers. These fares are applicable for bus, ferry, Access-A-Bus, community transit and MetroLink.

Worksheet Instructions

Using the values for annual ridership from Worksheet 1, and annual operating costs from Worksheet 6b and the Metro transit cost recovery (= 62 percent for 2005) calculate the resulting revenue on Worksheet 7.

Community Profile

- Fictional town of Spring Harbour, Nova Scotia with a population of 5,800.
- Compact community area with defined boundaries.
- There are no nearby communities to provide a connecting service.

Worksheet 1 – Who will use this service?

			2010 Population
1	HRM Estimate	(from Exhibit 5)	5,800
2	'Well Served' factor	.90 x Line 1	5,220
3			
4	Trips per capita	Line 2 X	13.55 ¹
ESTIMATED ANNUAL RIDERSHIP			70,731

¹ CUTA 2005 Operating Data (to be updated with most recent data)

Worksheet 2 – Where do people in my community want to travel?

10 Trip Generators
1 Spring Harbour Shopping Mall
2 Downtown Office Park
3 Rec Centre (for daily seniors' lunch program)
4 Spring Harbour Community College
5 Medical Clinic
6 Spring Harbour High School
7 Seniors' Apartment Complex
8 Spring Crescent Apartments and Townhouses
9 Midtown Residential Area
10 Uptown Industrial Park

Worksheet 3 – What type and level of service would best serve my community?

Time Period	✓	Type of service	Level of service (minutes)			
			20	30	60	Other (Specify)
<i>Weekday am</i>	✓	Fixed Route/Schedule		✓		
		Dynamic Routing				
		Demand Response	Not Applicable			
		No Service				
<i>Weekday mid-day</i>	✓	Fixed Route/Schedule			✓	
		Dynamic Routing				
		Demand Response	Not Applicable			
		No Service				
<i>Weekday pm</i>	✓	Fixed Route/Schedule		✓		
		Dynamic Routing				
		Demand Response	Not Applicable			
		No Service				
<i>Weekday evening</i>		Fixed Route/Schedule				
		Dynamic Routing				
	✓	Demand Response	Not Applicable			
		No Service				
<i>Saturday</i>		Fixed Route/Schedule				
		Dynamic Routing				
	✓	Demand Response	Not Applicable			
		No Service				
<i>Sunday</i>		Fixed Route/Schedule				
		Dynamic Routing				
		Demand Response	Not Applicable			
	✓	No Service				

Sketch - Town of Spring Harbor



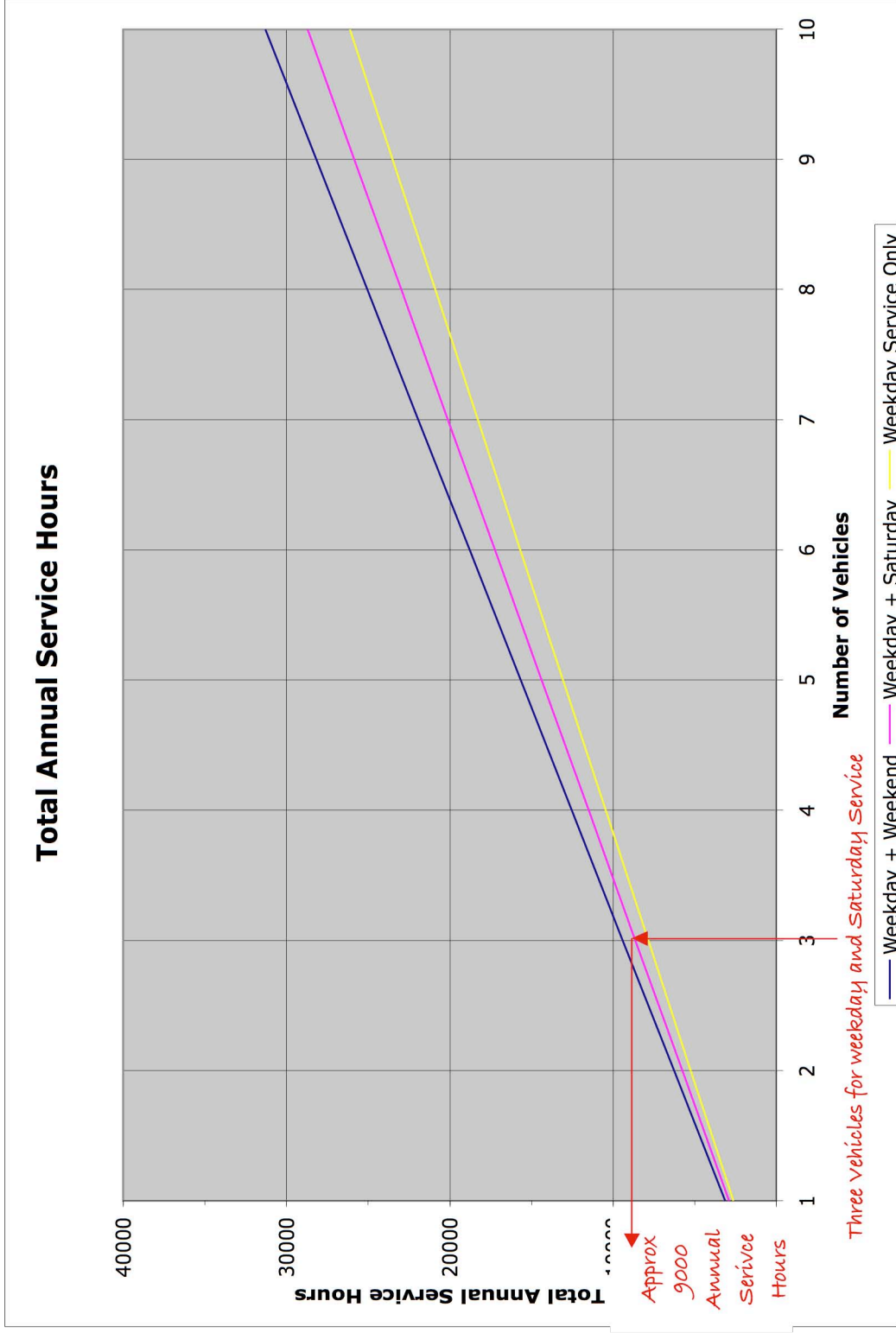
Worksheet 4 – What vehicle type is most appropriate for my community?

Vehicle Type	Unit Cost (Median)	Quantity	Total Cost
'Big' Bus	\$165,000	X _____	=
'Small Bus'	\$135,000	X <u> 2 </u>	= <u> \$270,000 </u>
Minivan	\$70,000	X <u> 1 </u>	= <u> \$70,000 </u>
VEHICLE COSTS AT IMPLEMENTATION			= <u> \$340,000 </u>

Worksheet 5 – What are the capital costs for this service?

Cost Component	Unit Cost	Quantity	Total Cost
Number of Routes	\$75,000	X <u>1</u>	<u>\$75,000</u>
Vehicle Cost		From Worksheet 4	= <u>\$340,000</u>
			= <u>\$415,000</u>
5 percent of total vehicle and passenger amenity costs as a contingency for remaining capital costs (office equipment, fareboxes, rights of way)			= \$20,750
TOTAL IMPLEMENTATION CAPITAL COSTS			= <u>\$435,750</u>

Worksheet 6a - What are the annual operating costs for this service?



Worksheet 6b - What are the annual operating costs for this service?

<i>Annual Service Hours</i>	(Worksheet 6a)	<u> 9000</u>
<i>Cost per Service Hour</i> ¹		X <u> \$78.63</u>
	Annual Operating Costs	<u> =\$707,670</u>

¹ CUTA 2005 Operating Data (to be updated with most recent data)

Worksheet 7 – Budget Summary

<i>Year 1 Capital Costs</i>	(Worksheet 5)	= \$435,750
<i>Annual Operating Costs</i>	(Worksheet 6b)	= \$707,670
TOTAL IMPLEMENTATION COSTS		= \$1,143,420

<i>Annual Operating Costs</i> =	Worksheet 6b	= \$707,670
<i>Annual Ridership</i>	Worksheet 1	= 70,731
<i>Metro Transit Cost Recovery</i> ¹		= 62% ¹
<i>Average Fare</i> ¹		= \$1.49 ¹

COST RECOVERY =	$\frac{\text{Annual Ridership} * \text{Average Fare}}{\text{Annual Operating Costs}}$	=	$\frac{70,731 * \$1.49}{\$707,670}$	=	15%
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Interpretation of results

The cost recovery for this service is very low, and should be increased. There are two options - reduce operating costs by decreasing the level of service offered, or increase ridership by increasing the service area.

Option 1 is preferred for Spring Harbour, as the population is within the community's boundaries and there are no neighbouring communities that could reasonably fall within the service area to increase ridership.

Consideration might be given to:

- Implementing Saturday and evening service at a subsequent time
- Starting the service with a one hour frequency all day, rather than a 30 minute frequency in the AM and PM peak times
- Reducing the number of vehicles required and operating demand responsive service until the demand for service is high enough to require a fixed-route service