SFMTA
Municipal
Transportation
Agency

2014 SFMTA Transit Fleet Management Plan

March 2014

1. Introduction

1-1 Introduction to the SFMTA

The San Francisco Municipal Transportation Agency (SFMTA) is the principal multi-modal agency responsible for planning, implementing and operating transportation services in the City and County of San Francisco. It is governed by a Board of Directors and is a business unit within the City and County of San Francisco. The SFMTA has the primary responsibility for the transportation system in San Francisco, providing the Agency with the unique ability to plan, design, construct, operate and manage (with key partnership from other agencies) the transit, paratransit, streets, bicycle, pedestrian, parking, traffic, taxi and commercial vehicle systems in San Francisco.

The SFMTA operates the oldest and largest transit system in the San Francisco Bay Area, transporting close to 43 percent of all transit passengers in the region. In addition, it is one of the top ten transit systems in the nation based on boardings, carrying more than 210 million passengers annually. The Agency's transit fleet is among the most diverse in the world, featuring:

- a historic collection of streetcars from the U.S. and around the world;
- modern light rail vehicles;
- bio-diesel and hybrid-electric bio-diesel buses;
- electric trolley coaches;
- the nation's only operating cable cars, listed as a U.S. National Historic Landmark; and
- a range of paratransit services.

As part of its mission, the SFMTA strives to provide a convenient, reliable, accessible and safe transportation system that meets the needs of all transportation users within the City and County of San Francisco.

1-2 Purpose of the SFMTA Transit Fleet Management Plan

The 2014 SFMTA Transit Fleet Management Plan (TFMP) maps out a systematic approach to the ongoing management and planning for rehabilitation and replacement of the SFMTA's fleet of transit vehicles through 2040. In particular, the objectives of this TFMP are as follows:

- Plan for replacement of the existing fleet, including all rubber-tired vehicles in the next 5 years;
- Plan for the replacement and expansion of the light rail vehicle fleet in anticipation of the opening of the Central Subway Project in 2019;
- Inform long-term storage and maintenance facility's needs;
- Identify opportunities to partner with agencies on procurements where possible to reduce unit costs and create a shared demand for future parts;
- Spread procurements more evenly to ensure major maintenance investments are not needed all at the same time;
- Accommodate planned Transit Effectiveness Project (TEP) service expansion by early 2015;
- Build in the flexibility to accommodate land use related growth and capital projects expected through 2020.

This update of the Transit Fleet Plan incorporates projections showing increased housing and employment in San Francisco between now and 2040. The San Francisco County Transportation Authority (SFCTA) 2040 travel demand forecast estimates that in 26 years, the SFMTA will need to carry over one million daily transit boardings, an increase of more than 40 percent than the approximately 700,000 carried today. Much of this growth in ridership occurs along planned routes serving major developments and in the eastern portion of the city. Although many of these projects were included in the previous Transit Fleet Management Plan to varying degrees, the magnitude and timing of these changes in land use, population, and employment have been further refined in this update. The TFMP translates this increase in transit ridership into a service plan and associated vehicle demand projections. Finally, this update begins to address some of the questions and issues that require ongoing study, such as transit facility needs.

1-3 Transit Fleet Management Plan Methodology

The TFMP is based on the most recent regional economic, land use, and population projections for the years 2020 and 2040. The Association of Bay Area Governments (ABAG) develops these projections and the San Francisco County Transportation Authority (SFCTA) utilizes the San Francisco travel demand model, SF-CHAMP, to develop forecasts for future trip origins, destinations, and travel choices. SF-CHAMP output includes forecasts for transit ridership along each transit line in years 2020 and 2040. The SFMTA then develops the service plan for each route necessary to meet this forecasted ridership demand. This service plan also establishes the number and type of vehicles needed to meet ridership demand, while maintaining the Agency's maximum load standard. The TFMP documents the plan to replace and expand the transit vehicle sub-fleets necessary to meet the associated service plans. The replacement of vehicles is governed by the useful life guidelines developed by both the Federal Transit Administration (FTA) and the Metropolitan Transportation Commission (MTC), as shown in Table 1. Vehicles cannot be retired or replaced prior to reaching their useful life without sufficient justification of extenuating circumstances, or repayment of a portion of the remaining vehicle value to FTA. Whenever possible, vehicle expansion procurements are timed with vehicle replacement procurements to take advantage of economies of scale and joint procurement opportunities.

Table1: FTA and MTC Vehicle Useful Life Guidelines

Vehicle Type	FTA Guidelines (years)	MTC Guidelines (years)
30ft Motor Coach	10	12
40 & 60ft Motor Coach	12	12
40 & 60ft Trolley Coach	15	15
Light Rail Vehicle	25	25
Historic Streetcar	N/A	N/A
Cable Car	N/A	N/A

N/A = Not Applicable.

1-4 Actions in Developing the Transit Fleet Management Plan

The TFMP has been extensively reviewed by Long Range Planning, Transit Service Planning, Transit Vehicle Procurement, the Director of Transit and the SFMTA Leadership Team.

As the TFMP was developed, information was shared with the Real Estate Vision for the 21st Century project team and relationships between peak service vehicle needs and the storage and maintenance of transit vehicles were collaboratively evaluated and reviewed.

2. Vehicle Replacement and Expansion

The development of the Transit Management Plan relies on SF-CHAMP ridership forecasts, the SFMTA service planning model, SFMTA policies regarding transit service, and the professional judgment of the SFMTA Service Planning group.

The SF-CHAMP ridership forecasts are used to determine the vehicle type, planned headway, and location where the passenger load is the greatest for each route during the AM and PM peak hours. The capacity at each maximum load point (MLP) is calculated based on the vehicle type assumptions in the SF-CHAMP forecasts. The SFMTA service policies as defined in Proposition E (1999) require the passenger load not exceed 85 percent of the peak hour capacity at any point along any route. Adjustments to headways for each route were made where necessary to ensure this standard was met. Where the required headway is less than seven minutes on routes planned for 40-foot motor coach service, reducing the headways and providing the service with 60-foot motor coaches was considered. This approach provides greater operational efficiency with minimal disruption to the user experience. Physical constraints along each route, such as turning radii, street widths, and grade changes were also considered when determining the size of vehicle used to provide service. Additionally, all routes adhered to the SFMTA service standards as defined in Appendix A. The mode used to provide service, such as changing 60-foot motor coaches to Light Rail Vehicles, was not considered in development of the Transit Management Plan. The SFMTA will study changes in service mode as part of the Rail Capacity Strategy.

The headway and vehicle type that resulted in appropriate passenger loads were then input into the SFMTA Service Planning model. The SFMTA Service Planning model uses empirical data to estimate the revenue miles, revenue hours, operating costs, and peak vehicle requirements for a service plan. For new or modified routes estimates of travel time from environmental planning studies or other available data sources are used. Appendix B provides the replacement and expansion procurement schedule necessary to meet the forecasted ridership demand and maintain acceptable spare ratios during peak service. Appendix C provides individual route headways and Appendix D provides individual route and fleet peak vehicle requirements. Vehicle characteristics are provided in Appendix E.

2-1 Motor Coach Sub-Fleet

The motor coach sub-fleet is the backbone of Muni service, carrying over 40 percent of the systems riders. The fleet currently consists of 477 vehicles from various manufacturers. The SFMTA recently put into service 112 New Flyer 40-foot hybrid buses,

allowing the Agency to retire its oldest buses. Over the next five years, the SFMTA plans to replace the remaining 365 vehicles with diesel electric hybrids.

Much of the forecasted growth in transit ridership is anticipated to occur along existing or planned 60 foot motor coach routes. This includes routes serving major development sites and the eastern portion of the city. Routes that are currently serviced by 40 foot motor coaches may also be converted to 60-foot motor coaches for operational efficiency purposes. This results in significant increases in the number of 60 foot motor coaches and a minor reduction in the number of 40-foot motor coaches by 2040. Whenever possible, the SFMTA plans to replace 40-foot motor coaches with 60-foot motor coaches to meet this need. This approach allows the SFMTA to adjust the fleet mix as efficiently as possible.

2-2 Trolley Coach Sub-Fleet

The SFMTA operates the largest trolley coach fleet in North America, currently consisting of 240 40-foot and 93 60-foot trolley coaches, although availability of these vehicles for service varies as discussed below. Trolley coaches, which do not produce any emissions, carry about 30 percent of system riders. Most trolley coach lines are expected to experience moderate growth in ridership through 2040. This is expected, as trolley coach lines are generally located in currently built out areas of San Francisco.

With over 20 years in service, the 60-foot New Flyer trolleys are the oldest buses in the system. From the original fleet of 60 vehicles, only 28 remain in daily operations while the remainder have been retired. To replace these vehicles, the SFMTA has entered into a joint procurement with King Country Metro in Seattle (the second largest trolley coach operator in the United States) and has awarded a contract to New Flyer. A test vehicle is scheduled to arrive in late 2014, with full replacement of the New Flyer 60-foot trolley sub-fleet in 2015. Additionally, the SFMTA plans to exercise vehicle options on the joint procurement contract with Seattle's King County Metro to replace the 40-foot and 60-foot ETI trolley coaches that will reach their useful lives in 2016, 2017 and 2018. Along with similar trolley coach vehicles procured by Vancouver's Translink in 2005, the SFMTA will be able to procure a common vehicle and ensure parts availability into the future.

In the early 2000's, planned expansion of the trolley coach network informed the procurement of 240 40-foot trolley coaches, but these trolley coach network expansion projects did not materialize. The TEP reevaluated the need for major expansions of the trolley coach network and determined that minor extensions or slight reroutes were the most efficient changes to make. With no major plans for expansion of the trolley coach network, the sub-fleet size will be adjusted to meet forecasted ridership demand over the course of the upcoming replacement cycle.

2-3 Light Rail Vehicle Sub-Fleet

The SFMTA Light Rail Vehicle sub-fleet consists of 151 cars, of which two are considered damaged beyond economically feasible repair and four are currently undergoing major repairs and scheduled to re-enter service by 2015. The six light rail lines serve about 20 percent of system riders. SFMTA has adopted a spare ratio policy for Light Rail Vehicles consistent with the motor coach policy of 20 percent. Ridership along light rail lines is

expected to increase with the opening of the Central Subway in 2019, increased growth in employment and housing along the existing light rail lines, and an extension of the M Line into Parkmerced. Two primary factors influenced the development of the light rail service plan. The first being the opening of Central Subway service, which is anticipated to be the highest ridership light rail line in San Francisco shortly after opening in 2019. The second factor is the physical capacity of the Muni Metro tunnel. Recent analysis by the SFMTA has determined the maximum capacity of Muni Metro tunnel based on current conditions. This accounts for the ability to reverse the direction of travel for light rail vehicles at the Muni Metro Turnback, just beyond the Embarcadero Station, as well as sending vehicles through to the 4th and King Station and reverse the direction of travel there. Increases in ridership on the L, M, and N lines, along with the M extension into Parkmerced and associated development, call for service levels above the capacity of the Muni Metro tunnel by 2040.This capacity constraint requires three car light rail vehicle trains to operate along the N-Judah line and two car light rail vehicles trains to operate on the J-Church and K-Ingleside lines by 2040. Operating trains in this manner allows the SFMTA to provide service to meet ridership demand within the physical vehicle capacity of the Muni Metro tunnel.

2-4 Historic Streetcar Sub-Fleet

Historic streetcars are one-of-kind vehicles of which there is a limited supply world-wide. The current historic streetcar fleet consists of 27 PCCs, 11 Milan Cars, and 8 unique vehicles. Historic streetcars were operated between 4th & King and Fisherman's Wharf at multiple times in 2013 as part of an E-Embarcadero service demo, but only the F-Market/Wharves line operates as part of regular revenue service. The F-Market/Wharves line carried about eight percent of system riders. Historic streetcars are not replaced, but do undergo complete overhauls as individual and groups of vehicles deteriorate and require more than the day-to-day maintenance the SFMTA is capable of providing. As such, a replacement and expansion plan is not provided herein. Expansion of the historic streetcar sub-fleet is driven by both vehicle needs and procurement opportunities, which are difficult to foresee.

The success of the F-Market/Wharves historic streetcar service has been recognized by transit agencies across the United States. However, this unique service presents challenges when attempting to use current travel demand modeling techniques to project ridership. The SFMTA anticipates high demand for this service into the future. The service plan for the F-Market/Wharves and future E-Embarcadero service plans were developed to meet anticipated ridership demand to the extent feasible given existing physical operational constraints, such as operating the E-Embarcadero, N-Judah, and T-Third services all on the Muni Metro Extension (MMX) guideway between the 4th and King Station and the MMX portal along the Embarcadero.

2-5 Cable Car Sub-Fleet

The proposed cable car sub-fleet would remain unchanged from the current 40 vehicle sub-fleet. The service plan for the two cable car lines would also remain unchanged, which currently provides service for about three percent of system riders. Similar to historic streetcars, cable cars are not replaced, but undergo rehabilitation as needed. This is performed by SFMTA staff on an on-going basis.

2-6 Spare Ratios

The SFMTA spare ratio is calculated by dividing the number of spare vehicles, or vehicles in excess of the peak service vehicle need, by the number of vehicles necessary for peak service. Spares are needed to perform scheduled and unscheduled maintenance activities. The spare ratio is calculated at the sub-fleet level. For example, in 2020 peak service demand for 60-foot motor coaches is 186 vehicles, leaving 38 vehicles as spares from the total sub-fleet of 224 60-foot motor coaches. This results in a spare ratio of 20 percent (38 divided by 186). Currently, a number of sub-fleets do not meet the SFMTA's spare ratio policy as shown in Table 2.

Table 2: SFMTA Transit Fleet Spare Ratio Policy

Vehicle Type	Spare Ratio Target
Motor Coach	
30-foot	30%
40-foot	20%
60-foot	20%
Trolley Coach	
40-foot	25%
60-foot	25%
Light Rail Vehicle	20%
Historic Streetcar	50%
Cable Car	50%

Under the 2014 Fleet Management Plan, spare ratios on all sub-fleets would meet the SFMTA policy except for a few exceptions when timing of procurements require sub-fleets to temporarily exceed adopted spare ratios. This is accomplished by shifting the SFMTA vehicle fleet mix and expanding particular sub-fleets to align with forecasted demand, essentially "right sizing" each sub-fleet, as shown in Appendix B. Because of the small size of the 30-foot motor coach fleet, a higher spare ratio is needed to ensure that sufficient vehicles are available to provide for this specialized service.

2-7 Contingency Sub-Fleet

San Francisco is host to special events with unique transit needs year round. Recently these have included two World Series parades, the America's Cup, and the annual Bay to Breakers race. Most SFMTA operators begin as motor or trolley coach operators and undergo significant training and testing prior to operating a vehicle in service. Additionally, reinvestment in the existing transportation system requires some services, such as trolley bus or light rail vehicle, to be temporarily suspended during reconstruction. For primarily these reasons, the SFMTA anticipates the need for 50 40 foot motor coaches to be stored and maintained for the purpose of special event service, bus operator training, and construction support service. These vehicles are part of the Contingency sub-fleet. Special event service needs vary depending on the number and magnitude of special events on any given day. SFMTA Bus Operations staff have identified the need for 24 vehicles for training purposes. This will allow SFMTA to adequately train new operators for San Francisco's transit environment. Major reinvestment projects in the coming years

include Sunset Tunnel Re-Rail, Twin Peaks Tunnel Re-Rail, and 33 Stanyan OCS Replacement, among others, and Bus Operations has indicated up to 26 vehicles could be needed to provide “bridge service” through or around construction zones. Finally, the Contingency sub-fleet may also be used for service anomalies caused by civil unrest, emergency agency actions, natural disasters, or fleet warranty retrofit campaigns. The vehicles necessary for these service conditions are difficult to predict. However, training and construction resources could temporarily be shifted to meet these needs. The contingency sub-fleet is and will continue to be instrumental in the agency’s efforts to ensure adequate service capacity is provided at all times.

As regular service vehicles reach the end of their useful life and are retired, select vehicles will be retained in the Contingency sub-fleet. The Contingency sub-fleet is used for the purposes described above and are not considered part of the active revenue fleet and are not scheduled for regular revenue service.

3. Related Planning Efforts

3-1 Transit Effectiveness Project

The Transit Effectiveness Project (TEP) aims to make Muni service more convenient, reliable and attractive to existing and potential customers and is the first major evaluation of transit service provision in San Francisco since the late 1970s. The TEP proposes service increases across San Francisco and concurrent necessary capital investments designed to improve safety and service reliability and reduce travel times. Environmental Review of the TEP is expected to be completed in March 2014 with proposed service increases implemented in Fiscal Year 2015 and 2016. The fleet needs associated with proposed TEP service levels are accounted for in the TFMP.

3-2 Central Subway

The Central Subway is scheduled to open in 2019, connecting the Chinatown neighborhood to the existing 4th and King Station via a 1.7 mile extension of the existing T-Third line with three underground and one street level station. Inputs into the T-Third service plan, such as running time, were derived by a simulation modeling of T-Third service developed as part of the Central Subway project. The TFMP supports the LRV4 Procurement Plan which will procure 24 new vehicles to support additional T-Third and Muni Metro service prior to opening of the Central Subway extension.

3-3 Van Ness Bus Rapid Transit

The Van Ness Bus Rapid Transit line is scheduled to open in 2018, providing semi-exclusive right of way, upgraded stations, and enhanced access to transit, among other features, for the 47-Van Ness and 49-Mission/Van Ness lines from Lombard Street to Mission Street. Currently the 49-Mission/Van Ness is served by a 60’ articulated trolley coach and the 47-Van Ness is served by a 40’ motor coach. In developing the Van Ness BRT service plan the need to upgrade the 47-Van Ness vehicle to a 60’ articulated motor coach was identified both to meet forecasted ridership demand and for operational efficiency when overlapping service is provided. The TFMP supports the Van Ness BRT service plan by procuring 15 additional 60’ articulated motor coaches in 2018 for this change is service vehicle type.

3-4 SFMTA Real Estate Vision for the 21st Century

In early 2012 the SFMTA embarked on an evaluation of existing and planned facility needs, including existing transit storage and maintenance facilities and development of a plan to modernize and expand transit storage and maintenance facilities to meet the agency's needs for the next 20 years. The vehicle needs identified in the 2010 TFMP served as inputs into the facilities analysis conducted under the Real Estate Vision for the 21st Century (RE Vision). The SFMTA Board of Directors adopted the RE Vision on January 15, 2013.

When comparing the 2010 TFMP and the inputs to the RE Vision to the draft 2014 TFMP it was determined that an Addendum to the RE Vision using the most up to date information would be appropriate. The timing of vehicle expansion and long-term vehicle needs identified in the draft 2014 TFMP resulted in the need for an additional vehicle storage and maintenance facility. Without this additional vehicle storage and maintenance facility the SFMTA will be unable to either expand vehicle sub-fleets, particularly motor coaches, or rehabilitate and modernize some of the oldest transit storage and maintenance facilities in the country at Presidio and Potrero Operating and Maintenance Facilities. Further details of the facilities modernization and expansion can be found in the RE Vision report and associated Addendum.

3-4 Vehicle Replacement and Expansion Funding

The SFMTA regularly forecasts funding that can be reasonably anticipated over the next 5 years as part of the Capital Improvement Program. Additionally, MTC policies prioritize vehicle replacement as the highest priority for a number of federal funding sources it allocates. Proposition K sales tax revenues administered by the SFCTA have traditionally provided the primary source of local match to these federal funds. Historically, these sources have met the regional needs for vehicle replacement and allows the SFMTA to assume all vehicle replacements will be funded through these sources in the future. MTC policies place a low priority on vehicle expansion for these same federal funding sources and the SFMTA assumes additional funding sources will need to be identified for vehicle expansion. Recently, potential sources of funding for vehicle expansion have been identified based on recommendations from the Mayor's Transportation Task Force and proposed MTC Core Capacity Challenge Grant Program. The Mayor's Transportation Task Force identified approximately $270 million of potential funding for vehicle investments through general obligation bonds, sales taxes, and vehicle license fees. The MTC Core Capacity Challenge Grant Program identified approximately $400 million of potential funding for vehicle investments through sources such as FTA formula funds, FTA New Starts Core Capacity funds, and Cap and Trade Revenues. The SFMTA is utilizing some of these sources to procure an additional 22 60-foot motor coach vehicles which are planned to be delivered by the end of 2015. Additionally, The SFMTA will continue to investigate funding opportunities for vehicle expansion and adjust vehicle procurement plans as more information becomes available.

Appendix A:
SFMTA Service Standards

APPENDIX A: SFMTA Service Standards

Muni Service Standards

Standard Type	Standard			
Coverage	All residential neighborhoods in San Francisco should be within a quarter of a mile of a Muni bus stop or rail line stop.			
Policy Headways	Minimum weekday headway established by route type			
	Weekday			
	Route Type	**Day**	**Evening**	**Late Night**
	Rapid	10	15	20
	Grid	20	20	30
	Circulator	30	30	--
	Specialized	Based on demand		
	Weekend			
	Route Type	**Day**	**Evening**	**Late Night**
	Rapid	12	15	20
	Grid	20	20	30
	Circulator	30	30	--
	*Based on demand, frequencies may be higher			
Passenger Loads	Operate service such that the peak hour, peak direction load factor does not exceed 85% of the combined seating and standing capacity (established by vehicle type)			
	Vehicle Type	**Planning Capacity**	**85% Load Standard**	
	30' Motor Coach	45	38	
	40' Motor Coach	63	54	
	60' Motor Coach	94	80	
	40' Trolley Coach	63	54	
	60' Trolley Coach	94	80	
	Light Rail Vehicle	119	101	
	Streetcar	60	51	
	Cable Car	63	54	
	*Crush load is approximately 125% of planning capacity			
Service Span	Minimum number of hours that service is available			
	Route Type	**Service Span Standard**		
	Rapid	18 hours		
	Grid	18 hours		
	Circulator	Based on demand		
	Specialized	Based on demand		
On-Time Performance (OTP)	**Route Type**	**Definition**	**OTP Standard**	
	Rapid	% of trips with a service gap of five minutes above the scheduled headway	Less than 14% of trips with a service gap	
	Grid	% of timepoints served within one minute early to four minutes late of the scheduled time	85% on-time (schedule adherence)	
	Circulator			

Appendix B: Replacement and Expansion Procurement Schedule

APPENDIX B: Vehicle Replacement and Procurement

	40 Foot Motor Coach Coach Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	8101-8159	Neoplan	2002	Diesel	58	8																										
	8305-8371	Neoplan	2003	Diesel	67	67	41																									
	8160-8235, 8301-8304	Neoplan (overhauled)	2002	Diesel	80	80	80	80	50																							
	8401-8456	Orion	2007	LF Hybrid	56	56	56	56	56	56																						
	8601-8662	New Flyer	2013	LF Hybrid	62	62	62	62	62	62	62	62	62	62	62	62																
Planned Procurements	8701-8750	New Flyer	2014	LF Hybrid		50	50	50	50	50	50	50	50	50	50	50	50															
		TBD	2015	LF Hybrid			48	48	48	48	48	48	48	48	48	48	48	48														
		TBD	2016	LF Hybrid				41	41	41	41	41	41	41	41	41	41	41	41														
		TBD	2017	LF Hybrid					30	30	30	30	30	30	30	30	30	30	30	30												
		TBD	2018	LF Hybrid						36	36	36	36	36	36	36	36	36	36	36	36											
		TBD	2019	LF Hybrid							45	45	45	45	45	45	45	45	45	45	45	45										
		TBD	2025	LF Hybrid													62	62	62	62	62	62	62	62	62	62	62	62				
		TBD	2026	LF Hybrid														45	45	45	45	45	45	45	45	45	45	45	45			
		TBD	2027	LF Hybrid															48	48	48	48	48	48	48	48	48	48	48	48		
		TBD	2028	LF Hybrid																35	35	35	35	35	35	35	35	35	35	35		
		TBD	2029	LF Hybrid																	30	30	30	30	30	30	30	30	30	30	30	
		TBD	2030	LF Hybrid																		36	36	36	36	36	36	36	36	36	36	
		TBD	2031	LF Hybrid																			40	40	40	40	40	40	40	40	40	
		TBD	2037	LF Hybrid																									52	52	52	52
		TBD	2038	LF Hybrid																										45	45	45
		TBD	2039	LF Hybrid																											44	44
		TBD	2040	LF Hybrid																												35
Fleet Statistics	Total Vehicles at Start of Fiscal Year					323	323	337	337	337	323	312	312	312	312	312	312	312	307	307	301	301	301	296	296	296	296	296	296	286	286	282
	Vehicles Replaced					50	34	41	30	36	45						62	45	48	35	30	36	40						52	45	44	
	Expansion/Contraction						+14			-14	-11							-5		-6			-5						-10		-4	
	Total Fleet					323	337	337	337	323	312	312	312	312	312	312	312	307	307	301	301	301	296	296	296	296	296	296	286	286	282	282
	Peak Service Demand					271	282	282	282	260	260	260	260	260	260	260	260	252	252	249	249	249	245	245	245	245	245	245	236	236	233	233
	Maintenance Spares					52	55	55	55	63	52	52	52	52	52	52	52	55	55	52	52	52	51	51	51	51	51	51	50	50	49	49
	Spare Ratio					19%	20%	20%	20%	24%	20%	20%	20%	20%	20%	20%	20%	22%	22%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%
	Average Vehicle Age (Years)					8.0	7.4	6.8	6.5	5.3	4.3	5.3	6.3	7.3	8.3	9.3	7.9	7.1	6.2	5.7	5.5	5.1	4.3	5.3	6.3	7.3	8.3	9.3	8.1	7.2	6.2	5.8

	60 Foot Motor Coach Coach Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	6200-6225	Neoplan	2002	Diesel	26																											
	6226-6299, 6401-6424	Neoplan	2003	Diesel	98	98	48																									
Planned Procurements		TBD	2014	LF Hybrid		26	26	26	26	26	26	26	26	26	26	26	26															
		TBD	2015	LF Hybrid			85	85	85	85	85	85	85	85	85	85	85	85														
		TBD	2016	LF Hybrid				48	48	48	48	48	48	48	48	48	48	48	48														
		TBD	2018	LF Hybrid						35	35	35	35	35	35	35	35	35	35	35	35											
		TBD	2019	LF Hybrid							30	30	30	30	30	30	30	30	30	30	30	30										
		TBD	2024	LF Hybrid													35	35	35	35	35	35	35	35	35	35	35					
		TBD	2026	LF Hybrid														26	26	26	26	26	26	26	26	26	26	26	26			
		TBD	2027	LF Hybrid															85	85	85	85	85	85	85	85	85	85	85	85		
		TBD	2028	LF Hybrid																55	55	55	55	55	55	55	55	55	55	55		
		TBD	2030	LF Hybrid																		35	35	35	35	35	35	35	35	35	35	
		TBD	2031	LF Hybrid																			30	30	30	30	30	30	30	30	30	
		TBD	2032	LF Hybrid																				25	25	25	25	25	25	25	25	
		TBD	2036	LF Hybrid																								35	35	35	35	35
		TBD	2037	LF Hybrid																									33	33	33	33
		TBD	2038	LF Hybrid																										26	26	26
		TBD	2039	LF Hybrid																											85	85
		TBD	2040	LF Hybrid																												55
Fleet Statistics	Total Vehicles at Start of Fiscal Year					124	124	159	159	159	194	224	224	224	224	224	259	259	259	259	266	266	266	266	291	291	291	291	291	324	324	324
	Vehicles Replaced					26	50	48										26	85	48		35	30					35		26	85	55
	Expansion/Contraction						+35 [1]			+35	+30					+35				+7				+25					+33			
	Total Fleet					124	159	159	159	194	224	224	224	224	224	259	259	259	259	266	266	266	266	291	291	291	291	291	324	324	324	324
	Peak Service Demand					105	131	131	131	158	186	186	186	186	186	206	206	206	206	217	217	217	217	237	237	237	237	237	270	270	270	270
	Maintenance Spares					19	28	28	28	36	38	38	38	38	38	53	53	53	53	49	49	49	49	54	54	54	54	54	54	54	54	54
	Spare Ratio					18%	21%	21%	21%	23%	20%	20%	20%	20%	20%	26%	26%	26%	26%	23%	23%	23%	23%	23%	23%	23%	23%	23%	23%	20%	20%	20%
	Average Vehicle Age (Years)					9.7	4.8	1.9	2.9	3.3	3.9	4.9	5.9	6.9	7.9	7.8	8.8	8.6	5.7	4.4	5.4	4.8	4.4	5.1	6.1	7.1	8.1	7.2	7.5	7.5	5.2	3.7

Note [1] Funding for approximately 22 vehicles of the 35 vehicle expansion has been identified

Funding for vehicle procurement has been identified

Funding for vehicle procurement has NOT been identified

APPENDIX B: Vehicle Replacement and Procurement

	40 Foot Trolley Coach Coach Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	5401-5481	ETI	2001	Trolley	21	21	21	0																								
	5401-5640	ETI	2002	Trolley	108	108	108	108																								
	5482-5640	ETI	2003	Trolley	94	94	94	94	94																							
	5482-5640	ETI	2004	Trolley	17	17	17	17	17	17																						
		New Flyer	2016	LF Trolley				21	21	21	21	21	21	21	21	21	21	21	21	21	21	21										
		New Flyer	2017	LF Trolley					108	108	108	108	108	108	108	108	108	108	108	108	108	108	108									
		New Flyer	2018	LF Trolley						46	46	46	46	46	46	46	46	46	46	46	46	46	46	46								
		TBD	2031	LF Trolley																			36	36	36	36	36	36	36	36	36	36
		TBD	2032	LF Trolley																				108	108	108	108	108	108	108	108	108
		TBD	2033	LF Trolley																					46	46	46	46	46	46	46	46
Fleet Statistics				Total Vehicles at Start of Fiscal Year		240	240	240	240	240	192	175	175	175	175	175	175	175	175	175	175	175	175	190	190	190	190	190	190	190	190	190
				Vehicles Replaced				21	108	46													21	94								
				Expansion/Contraction						-48	-17												+15									
				Total Fleet		240	240	240	240	192	175	175	175	175	175	175	175	175	175	175	175	175	190	190	190	190	190	190	190	190	190	190
				Peak Service Demand		164	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	151	151	151	151	151	151	151	151	151	151
				Maintenance Spares		76	100	100	100	52	35	35	35	35	35	35	35	35	35	35	35	35	39	39	39	39	39	39	39	39	39	39
				Spare Ratio		46%	71%	71%	71%	37%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%
				Average Vehicle Age (Years)		2.0	2.2	1.0	1.6	2.8	2.3	3.1	3.8	4.5	5.3	6.0	6.8	7.5	8.2	9.0	9.7	10.4	8.5	0.6	1.4	2.2	3.0	3.8	4.6	5.4	6.2	7.1

	60 Foot Trolley Coach Coach Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	7000-7059	New Flyer	1994	Trolley	60	28																										
	7101-7133	ETI	2002	Trolley	33	33	33	33																								
Planned Procurements		New Flyer	2014	LF Trolley		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1											
		New Flyer	2015	LF Trolley			59	59	59	59	59	59	59	59	59	59	59	59	59	59	59											
		New Flyer	2016	LF Trolley					45	45	45	45	45	45	45	45	45	45	45	45	45	45	45									
		TBD	2030	LF Trolley																		60	60	60	60	60	60	60	60	60	60	60
		TBD	2031	LF Trolley																				50	50	50	50	50	50	50	50	50
Fleet Statistics				Total Vehicles at Start of Fiscal Year		61	62	93	93	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	110	110	110	110	110	110	110	110
				Vehicles Replaced		1	59		33													60		45								
				Expansion/Contraction					+12															+5								
				Total Fleet		62	93	93	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	110	110	110	110	110	110	110	110	110
				Peak Service Demand		46	77	77	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	88	88	88	88	88	88	88	88	88
				Maintenance Spares		16	16	16	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
				Spare Ratio		35%	21%	21%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	25%	25%	25%	25%	25%	25%	25%	25%	25%
				Average Vehicle Age (Years)		16.4	5.6	6.6	2.6	3.6	4.6	5.6	6.6	7.6	8.6	9.6	10.6	11.6	12.6	13.6	14.6	7.0	8.0	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5

Note Funding for vehicle procurement has been identified
Funding for vehicle procurement has NOT been identified

APPENDIX B: Vehicle Replacement and Procurement

	Light Rail Vehicles Vehicle Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	1400-1424	Breda	1997	LRV 2	25	25	25	25	25	25	25	25	22																			
	1425-1451	Breda	1998	LRV 2	27	24	25	25	25	25	25	25	25	23																		
	1452-1475	Breda	1999	LRV 2	24	24	24	24	24	24	24	24	24	24	23																	
	1476-1481	Breda	2000	LRV 2	6	6	6	6	6	6	6	6	6	6	6	5																
	1482-1507	Breda	2001	LRV 3	27	26	26	27	27	27	27	27	27	27	27	27	14																
	1509-1534	Breda	2002	LRV 3	26	26	26	26	26	26	26	26	26	26	26	26	26	16															
	1535-1550	Breda	2003	LRV 3	16	15	15	16	16	16	16	16	16	16	16	16	16	16	8														
Planned Procurements		TBD	2017	LRV 4					6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
		TBD	2018	LRV 4						18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		TBD	2019	LRV 4							18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		TBD	2020	LRV 4								14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
		TBD	2021	LRV 4									13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
		TBD	2022	LRV 4										24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2023	LRV 4											24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2024	LRV 4												24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2025	LRV 4													24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2026	LRV 4														24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2027	LRV 4															24	24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2028	LRV 4																24	24	24	24	24	24	24	24	24	24	24	24	24
		TBD	2029	LRV 4																	23	23	23	23	23	23	23	23	23	23	23	23
Fleet Statistics	Total Vehicles at Start of Fiscal Year					140	146	147	149	155	173	191	205	215	215	215	215	221	221	221	237	260	260	260	260	260	260	260	260	260	260	260
	Vehicles Replaced												5	24	24	24	18	24	24	8												
	Expansion/Contraction								+6	+18	+18	+14	+8				+6			+16	+23												
	Total Fleet [1]					146	147	149	155	173	191	205	215	215	215	215	221	221	221	237	260	260	260	260	260	260	260	260	260	260	260	260
	Peak Service Demand					113	113	113	113	113	160	177	179	179	179	179	187	187	187	195	195	195	195	201	201	201	207	207	207	213	213	217
	Maintenance Spares					33	34	36	42	60	31	28	36	36	36	36	34	34	34	42	65	65	65	59	59	59	53	53	53	47	47	43
	Spare Ratio					29%	30%	32%	37%	53%	19%	16%	20%	20%	20%	20%	18%	18%	18%	22%	33%	33%	33%	29%	29%	29%	26%	26%	26%	22%	22%	20%
	Average Vehicle Age (Years)					15.2	16.2	17.1	17.5	16.7	16.1	16.0	15.9	14.1	12.3	10.6	9.3	7.6	6.0	5.7	6.2	7.2	8.2	9.2	10.2	11.2	12.2	13.2	14.2	15.2	16.2	17.2

Note: [1] Total LRV fleet adjusted for major repairs. Major repairs return to service by 2016. Two vehicles will not return to service until replaced in 2021.

	30 Foot Motor Coach Coach Number	Manfacturer	Year In Service	Type	Original Qty	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Existing Fleet	8501-8530	Orion	2007	LF Hybrid	30	30	30	30	30	30																						
Planned Procurements		TBD	2019	LF Hybrid							26	26	26	26	26	26	26	26	26	26	26	26										
		TBD	2031	LF Hybrid																			26	26	26	26	26	26	26	26	26	26
Fleet Statistics	Total Vehicles at Start of Fiscal Year					30	30	30	30	30	30	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
	Vehicles Replaced										26												26									
	Expansion/Contraction										-4																					
	Total Fleet					30	30	30	30	30	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
	Peak Service Demand					20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Maintenance Spares					10	10	10	10	10	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Spare Ratio					50%	50%	50%	50%	50%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	Average Vehicle Age (Years)					8.0	9.0	10.0	11.0	12.0	0.9	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0

Note: Funding for vehicle procurement has been identified
Funding for vehicle procurement has NOT been identified

Appendix C: Individual Route and Line Headways

APPENDIX C: Route Headways and Vehicle Types

Route	Vehicle Type			AM Peak Hour Headway			PM Peak Hour Headway		
	Existing (2012)	2020	2040	Existing (2012)	2020	2040	Existing (2012)	2020	2040
1	T Std	T Std	T Std	7.0	6.0	6.0	7.0	5.0	5.0
1 Short	T Std	T Std	T Std	7.0	6.0	6.0	7.0	5.0	5.0
1AX	M Std	M Std	M Std	9.0	8.0	8.0	13.0	13.0	13.0
1BX	M Artic	M Artic	M Artic	7.0	7.0	7.0	12.0	12.0	12.0
2	M Std	M Std	M Std	12.0	10.0	10.0	12.0	10.0	9.0
2 Short		T Std	T Std		10.0	10.0		10.0	9.0
3	T Std			12.0			12.0		
5	T Std			5.0			4.5		
5 Short	T Std	T Artic	T Artic	8.0	7.0	7.0	9.0	7.0	6.0
5, 5L		T Artic	T Artic		7.0	7.0		7.0	6.0
6	T Std	T Std	T Std	10.0	10.0	10.0	10.0	10.0	10.0
8	M Std						10.0		
8X, 8BX	M Artic	M Artic	M Artic	7.5	7.5	6.0	7.5	7.5	7.5
8AX	M Artic	M Artic	M Artic	8.0	7.5	7.0	7.5	7.5	7.5
9	M Std	M Std	M Std	12.0	10.0	10.0	12.0	10.0	10.0
9L	M Std	M Std	M Std	12.0	7.5	6.0	12.0	9.0	9.0
10	M Std	M Std	M Std	20.0	12.0	10.0	20.0	12.0	10.0
10 Short		M Std	M Std		12.0	10.0		12.0	10.0
11		M Std	M Std		12.0	12.0		12.0	12.0
12	M Std	M Std	M Std	20.0			20.0		
14	T Artic	M Artic	M Artic	15.0	9.0	8.0	15.0	9.0	8.0
14 Short	T Artic			15.0			15.0		
14L	M Artic	T Artic	T Artic	9.0	7.5	6.0	8.0	7.5	7.0
14X	M Artic	M Artic	M Artic	8.0	9.0	7.0	8.0	9.0	9.0
16X	M Std	M Std	M Std	9.0	10.0	10.0	9.0	10.0	10.0
17	M Small	M Std	M Std	30.0	20.0	20.0	30.0	15.0	12.0
18	M Std	M Std	M Std	20.0	20.0	20.0	20.0	20.0	20.0
19	M Std	M Std	M Std	15.0	12.0	12.0	15.0	15.0	15.0
21	T Std	T Std	T Std	6.0	7.0	6.5	10.0	8.0	7.0
22	T Std	T Std	T Std	9.0	10.0	8.0	8.0	10.0	10.0
22 Short		T Artic	T Artic		10.0	8.0		10.0	10.0
23	M Std	M Std	M Std	20.0	15.0	15.0	20.0	15.0	15.0
24	T Std	T Std	T Std	10.0	9.0	6.0	10.0	9.0	6.0
27	M Std	M Std	M Std	15.0	15.0	15.0	15.0	15.0	15.0
28	M Std	M Std	M Std	10.0	9.0	9.0	10.0	9.0	9.0
28L	M Std	M Std	M Artic	10.0	9.0	9.0	20.0	9.0	7.0
29	M Std	M Std	M Artic	9.2	9.0	10.0	10.0	10.0	10.0
29 Short			M Artic			10.0			10.0
30	T Std	T Artic	T Artic	7.0	7.0	7.0	12.0	10.0	10.0
30 Short	T Std						6.0		
30X	M Std	M Artic	M Artic	4.0	5.5	5.5	7.5	9.0	9.0
31	T Std	T Std	T Std	12.0	12.0	12.0	14.0	10.0	10.0
31AX	M Std	M Std	M Std	12.0	12.0	12.0	11.0	11.0	11.0
31BX	M Std	M Std	M Std	10.0	10.0	10.0	12.0	12.0	12.0
32		M Small	M Small		20.0	20.0		20.0	20.0
33	T Std	T Std	T Std	15.0	15.0	15.0	15.0	15.0	15.0
35	M Small	M Small	M Small	30.0	20.0	20.0	20.0	20.0	20.0
36	M Small	M Small	M Small	30.0	20.0	20.0	30.0	20.0	15.0
37	M Small	M Small	M Small	15.0	15.0	15.0	20.0	12.0	12.0
38	M Artic	M Artic	M Artic	12.0	5.5	5.5	16.0	6.0	6.0
38 Short	M Artic			12.0			12.0		
38L Short		M Artic	M Artic		5.5	5.5		5.5	5.5

APPENDIX C: Route Headways and Vehicle Types

Route	Vehicle Type			AM Peak Hour Headway			PM Peak Hour Headway		
	Existing (2012)	2020	2040	Existing (2012)	2020	2040	Existing (2012)	2020	2040
38AX	M Std	M Artic	M Artic	11.0	5.5	5.5	9.0	6.0	6.0
38BX	M Std			11.0			9.0		
38L	M Artic	M Artic	M Artic	5.5	5.5	5.5	5.5	5.5	5.5
39	M Small	M Small	M Small				20.0	20.0	20.0
41 (AM)	T Artic	T Std	T Std	8.0	6.0	5.0			
41 (PM)	T Std	T Std	T Std				8.0	6.0	6.0
43	M Std	M Std	M Std	10.0	7.0	7.0	12.0	10.0	10.0
44	M Std	M Artic	M Artic	8.6	8.0	8.0	9.2	8.0	8.0
45	T Std	T Std	T Std	7.0	7.0	7.0	12.0	10.0	10.0
47	M Std	M Artic	M Artic	10.0	7.5	6.0	10.0	7.5	7.0
48	M Std	M Std	M Std	10.0	15.0	15.0	12.0	15.0	15.0
49	T Artic			8.0			8.0		
49L		T Artic	T Artic		7.5	6.0		7.5	7.0
52	M Small	M Std	M Std	20.0	20.0	20.0	20.0	20.0	20.0
54	M Std	M Std	M Std	20.0	15.0	15.0	20.0	15.0	15.0
56	M Small	M Small	M Small	30.0	20.0	20.0	30.0	20.0	20.0
58		M Std	M Std		15.0	12.0		15.0	15.0
66	M Small	M Small	M Small	20.0	20.0	20.0	20.0	20.0	20.0
67	M Small	M Small	M Small	20.0	20.0	20.0	20.0	20.0	20.0
71, 71L	M Std	M Artic	M Artic	10.0	9.0	9.0	10.0	9.0	9.0
76	M Std								
80X	M Std			120.0					
81X	M Std	M Std	M Std	20.0	20.0	20.0			
82X	M Std	M Std	M Std	10.0	9.0	9.0	12.0	15.0	15.0
83X		M Std	M Std		15.0	15.0		15.0	15.0
88	M Std	M Std	M Std	20.0	10.0	10.0	20.0	10.0	10.0
90	M Std	M Std	M Std						
91	M Std	M Std	M Std						
94L (L Owl)	M Std	M Std	M Std						
94N (N Owl)	M Std	M Std	M Std						
108	M Std	M Std	M Artic	10.0	6.0	7.0	15.0	8.0	7.0
109			M Std			7.5			12.0
CPX			M Artic			10.0			12.0
HPX		M Std	M Artic		20.0	10.0		20.0	12.0
E		Streetcar	Streetcar		15.0	12.0		12.0	10.0
F	Streetcar	Streetcar	Streetcar	6.7	7.5	7.5	5.0	5.0	4.0
J	LRV1	LRV1	LRV2	9.0	6.5	12.0	9.0	7.5	12.0
K		LRV1	LRV2		6.5	12.0		7.5	12.0
KT	LRV1			9.0			9.0		
L	LRV2	LRV2	LRV2	8.0	6.5	6.0	7.5	7.5	6.0
M	LRV2	LRV2	LRV2	9.0	13.0	12.0	9.2	15.0	12.0
M Short		LRV2	LRV2		13.0	12.0		15.0	12.0
N	LRV2	LRV3	LRV3	7.0	6.5	6.0	7.0	7.5	6.0
T		LRV2	LRV2		8.0	5.0		8.0	5.0
T Short		LRV2	LRV2		8.0	5.0		8.0	5.0
NX	M Std	M Std	M Std	10.0	10.0	10.0	10.0	8.0	8.0
Cable Car	Cable Car	Cable Car	Cable Car	8.0	8.0	8.0	8.0	8.0	8.0

Appendix D: Individual Route and Line Peak Period Vehicle Requirements

APPENDIX D: Peak Service Vehicle Demand

Route	Vehicle Type			PEAK SERVICE VEHICLES					
				AM Peak			PM Peak		
	Existing (2012)	2020	2040	Existing (2012)	2020	2040	Existing (2012)	2020	2040
1	T Std	T Std	T Std	15	17	17	15	21	21
1 Short	T Std	T Std	T Std	9	11	11	10	13	13
1AX	M Std	M Std	M Std	9	10	10	6	6	6
1BX	M Artic	M Artic	M Artic	9	9	9	6	6	6
2	M Std	M Std	M Std	8	10	10	9	11	12
2 Short		T Std	T Std		6	6		7	8
3	T Std			6			7		
5	T Std			14			14		
5 Short	T Std	T Artic	T Artic	11	11	11	11	12	14
5, 5L		T Artic	T Artic		15	15		16	19
6	T Std	T Std	T Std	11	14	14	12	14	14
8	M Std						4		
8X, 8BX	M Artic	M Artic	M Artic	21	18	22	23	19	19
8AX	M Artic	M Artic	M Artic	10	11	12	11	12	12
9	M Std	M Std	M Std	12	14	14	12	14	14
9L	M Std	M Std	M Std	9	14	18	9	12	12
10	M Std	M Std	M Std	7	11	13	7	12	14
10 Short		M Std	M Std		4	4		4	5
11		M Std	M Std		8	8		9	9
12	M Std			6			6		
14	T Artic	M Artic	M Artic	10	16	18	11	17	19
14 Short	T Artic			9			10		
14L	M Artic	T Artic	T Artic	15	14	18	18	17	18
14X	M Artic	M Artic	M Artic	11	10	12	11	10	10
16X	M Std	M Std	M Std	9	9	9	9	10	10
17	M Small	M Std	M Std	2	4	4	2	6	7
18	M Std	M Std	M Std	5	4	4	5	4	4
19	M Std	M Std	M Std	9	8	8	10	7	7
21	T Std	T Std	T Std	12	13	14	10	12	14
22	T Std	T Std	T Std	13	12	14	16	12	12
22 Short		T Artic	T Artic		8	10		9	9
23	M Std	M Std	M Std	5	7	7	6	7	7
24	T Std	T Std	T Std	13	14	21	12	13	20
27	M Std	M Std	M Std	7	7	7	7	8	8
28	M Std	M Std	M Std	12	10	10	13	11	11
28L	M Std	M Std	M Artic	11	15	21	4	17	29
29	M Std	M Std	M Artic	22	19	17	18	18	21
29 Short			M Artic			6			6
30	T Std	T Artic	T Artic	13	14	14	9	11	11
30 Short	T Std						13		
30X	M Std	M Artic	M Artic	16	12	12	9	7	7
30X (AM)									
30X (PM)		M Artic	M Artic						
31	T Std	T Std	T Std	10	10	10	9	12	12
31AX	M Std	M Std	M Std	8	8	8	7	7	7
31BX	M Std	M Std	M Std	7	7	7	6	6	6
32		M Small	M Small		2	2		2	2
33	T Std	T Std	T Std	8	9	9	8	10	10
35	M Small	M Small	M Small	1	2	2	2	2	2
36	M Small	M Small	M Small	3	5	5	3	6	6
37	M Small	M Small	M Small	5	3	3	4	3	3
38	M Artic	M Artic	M Artic	10	20	22	8	19	21
38 Short	M Artic			10			9		
38L Short		M Artic	M Artic		17	21		18	22
38AX	M Std	M Artic	M Artic	8	14	15	9	12	14
38BX	M Std			7			8		
38L	M Artic	M Artic	M Artic	18	16	18	19	17	19
39	M Small	M Small	M Small				2	2	2
41 (AM)	T Artic	T Std	T Std	8	12	14			
41 (PM)	T Std	T Std	T Std				10	13	13
43	M Std	M Std	M Std	17	27	27	14	19	19
44	M Std	M Artic	M Artic	16	17	17	16	18	18
45	T Std	T Std	T Std	12	13	13	8	9	9
47	M Std	M Artic	M Artic	10	12	14	11	12	13
48	M Std	M Std	M Std	13	11	11	12	11	11
49	T Artic			19			19		
49L		T Artic	T Artic		14	17		16	17
52	M Small	M Std	M Std	4	5	5	4	5	5
54	M Std	M Std	M Std	7	9	9	7	9	9
56	M Small	M Small	M Small	2	1	1	2	1	1
58		M Std	M Std		6	7		6	6
66	M Small	M Small	M Small	2	2	2	2	2	2
67	M Small	M Small	M Small	2	2	2	2	2	2
71, 71L	M Std	M Artic	M Artic	13	14	14	14	16	16
76	M Std	M Std	M Std						
80X	M Std			1					
81X	M Std	M Std	M Std	2	2	2			
82X	M Std	M Std	M Std	5	5	5	4	3	3
83X		M Std	M Std		4	4		4	4
88	M Std	M Std	M Std	2	3	3	2	3	3

APPENDIX D: Peak Service Vehicle Demand

Route	Vehicle Type			PEAK SERVICE VEHICLES					
				AM Peak			PM Peak		
	Existing (2012)	2020	2040	Existing (2012)	2020	2040	Existing (2012)	2020	2040
90	M Std	M Std	M Std						
91	M Std	M Std	M Std						
94L (L Owl)	M Std	M Std	M Std						
94N (N Owl)	M Std	M Std	M Std						
108	M Std	M Std	M Artic	4	7	6	3	5	6
109			M Std			9			6
CPX			M Artic			8			6
HPX		M Std	M Artic		3	6		3	5
E		Streetcar	Streetcar		4	5		6	7
F	Streetcar	Streetcar	Streetcar	13	13	13	23	23	28
J	LRV1	LRV1	LRV2	10	13	14	10	12	16
K		LRV1	LRV2		18	22		16	22
KT	LRV1			19			19		
L	LRV2	LRV2	LRV2	20	28	30	24	24	30
M	LRV2	LRV2	LRV2	22	16	18	24	14	18
M Short		LRV2	LRV2		12	14		12	14
N	LRV2	LRV3	LRV3	34	54	60	36	51	63
T		LRV2	LRV2		24	36		24	36
T Short		LRV2	LRV2		12	18		12	18
NX	M Std	M Std	M Std	9	9	9	8	10	10
Cable Car	Cable Car	Cable Car	Cable Car	19	19	19	27	27	27
ROUTE TOTAL				731	883	996	750	888	1,017

TOTALS	Existing (2012)	2020	2040	Existing (2012)	2020	2040	Peak Service Demand		
							Existing (2012)	2020 Max Peak	2040 Max Peak
Total M Artic	104	186	270	105	183	269	105	186	270
Total M Std	276	260	232	255	247	215	276	260	232
Total M Small	21	17	17	23	20	20	23	20	20
Total T Artic	46	76	85	40	81	88	46	81	88
Total T Std	147	131	143	164	136	146	164	136	146
Total Streetcar	13	17	18	23	29	35	23	29	35
Total LRV	105	177	212	113	165	217	113	177	217
Total Cable Car	19	19	19	27	27	27	27	27	27
FLEET TOTAL	731	883	996	750	888	1,017	777	916	1,035

	Spare Ratio	*Peak Vehicle Demand (Incl. Spares)*		
		Existing (2012)	2020 Max Peak	2040 Max Peak
Total M Artic	20%	126	224	324
Total M Std	20%	332	312	279
Total M Small	30%	30	26	26
Total T Artic	25%	58	102	110
Total T Std	25%	205	170	183
Total Streetcar	50%	35	44	53
Total LRV	20%	136	212	260
Total Cable Car	n/a	40	40	40

Appendix E: Sub-Fleet Vehicle Characteristics

APPENDIX E: Sub-Fleet Vehicle Characteristics

Sub-Fleet	Size	Person Capacity	Wheel Chair Capacity
Motor Coach	40'	63	2
Motor Coach	60'	94	2
Trolley Coach	40'	63	2
Trolley Coach	60'	94	2
Light Rail Vehicle	75'	119	4
Historic Streetcar	Varies	Varies	Varies
Cable Car	30'	63	Wheelchair storage at the discretion of the operator on Hyde and Mason cars