Section 2: Tri-Rail Station Parking Projections

This section provides parking projections for Tri-Rail's 18 stations for four future year horizons through 2025 (2010, 2015, 2020, and 2025) and two ridership growth scenarios. The two ridership growth scenarios are (1) that assumed in the *Full Funding Grant Agreement (FFGA) Amendment*, and (2) a growth rate 25 percent higher than that assumed in the FFGA Amendment.

The approach taken to forecast parking demand at Tri-Rail stations is based on a review of daily train ridership, historical train station parking supply, and station area parking utilization, together with an assessment of future ridership forecasts. The future ridership forecasts reflect regional population growth based on the three local Metropolitan Planning Organizations' (MPO) long range transportation plans, as included in the FFGA Amendment. The data necessary for parking projections were obtained from reports published by SFRTA and FDOT.

Historical Tri-Rail Ridership

SFRTA provided data on annual ridership by station dating back to 1999. Figure 10 shows historical ridership of the Tri-Rail system from 1999 to 2008, together with the number of trains per day. Note that 2008 ridership data is developed based on the July 2008 ridership statistics when parking count data was collected.

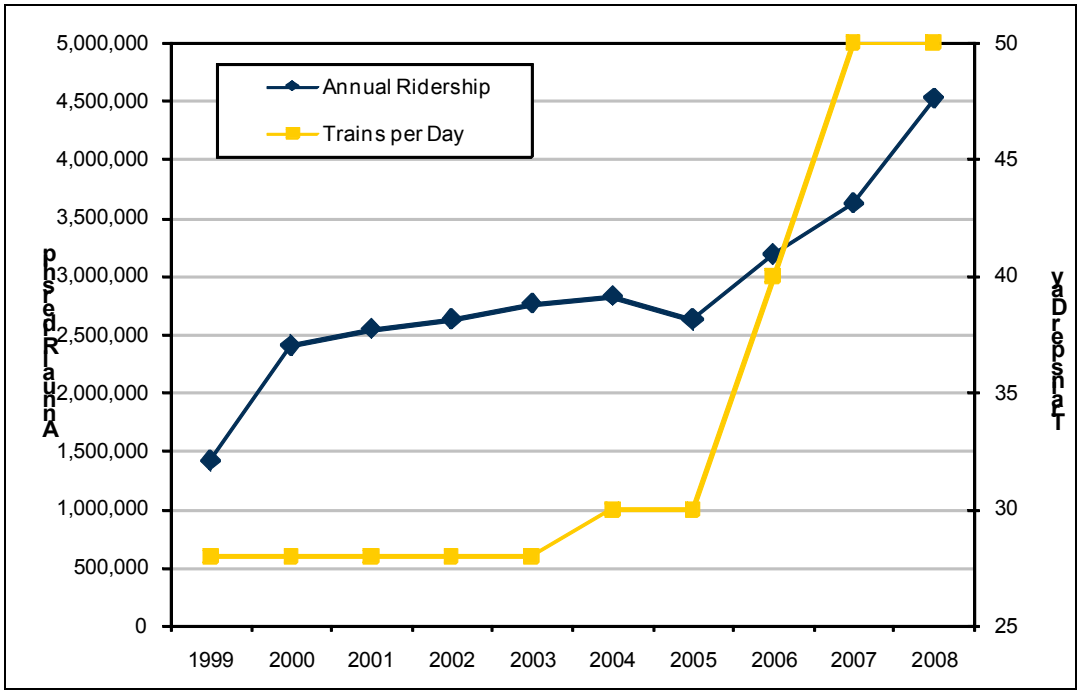

Figure 10: Historical Train Service and Ridership[2]

[2] Annual Ridership through July 31, 2008, South Florida Regional Transportation Authority

It is evident that service provision (trains per day) and ridership have been closely related since the double-tracking of the corridor. SFRTA indicated that the 30 percent increase in service in 2006 resulted in an increase of 30-35 percent in ridership. Recently, due to escalation of gasoline price and possibly the economic slowdown, it appears more "choice riders" selected transit or park-n-ride as part of their daily commute trips. Transit ridership has increased noticeably throughout the South Florida region. In July 2008, SFRTA announced a significant ridership growth of 20.8 percent for the first half of 2008 when compared with the same period in 2007.

Table 11 and Figure 11 show historical ridership from 2000 to 2008. Table 11 further calculates the proportion of each station's ridership over total system ridership (last two columns). Note that the proportion varies only slightly from 2000 to 2008, as demonstrated by the "range of 90 percent confidence level." This data indicates a consistent trend in the proportion of boardings attributed to each station, with a few exceptions including Fort Lauderdale, Fort Lauderdale Airport, Sheridan, and Hialeah Market. A confidence level indicates the degree of certainty that an assumption returns from a statistical test. Using the north end station, Mangonia Park, as an example, for a 90 percent confidence level, the proportion of Mangonia Park station's ridership over total ridership is 6.7%*(1 ± 3.9%), which remains within 6.4 percent - 7.0 percent of total ridership from 2000 through 2006.

Table 11: Tri-Rail Average Daily Ridership

Station	Historical Ridership									00-06 Avg.	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	Pct	Range of 90% confidence level
Mangonia Park	553	582	591	611	597	550	620	774	946	6.7%	3.9%
West Palm Beach	674	751	868	928	850	790	885	1,021	1,276	9.0%	5.0%
Lake Worth Station	469	497	527	556	590	544	594	712	788	5.6%	2.7%
Boynton Beach	456	503	504	484	559	506	613	738	824	5.8%	2.8%
Delray Beach	324	348	355	384	419	389	450	511	608	4.3%	2.4%
Boca Raton	474	521	559	578	581	523	671	770	892	6.3%	1.7%
Deerfield Beach	391	385	414	450	476	434	521	578	699	4.9%	2.2%
Pompano Beach	388	398	372	429	442	420	530	586	683	4.8%	3.0%
Cypress Creek Station	457	446	443	468	478	472	599	670	779	5.5%	4.0%
Fort Lauderdale	654	656	641	667	693	620	718	770	1,066	7.5%	6.0%
Fort Lauderdale Airport	256	304	337	355	399	402	530	612	585	4.1%	10.6%
Sheridan Street	235	236	219	226	243	243	343	351	393	2.8%	5.9%
Hollywood	412	473	507	536	533	457	571	600	794	5.6%	4.4%
Golden Glades	302	331	335	362	379	364	472	497	576	4.1%	3.2%
Opa Locka Station	122	129	139	151	154	136	198	180	229	1.6%	4.4%
Metrorail	1,270	1,326	1,326	1,355	1,349	1,289	1,505	1,851	2,181	15.4%	3.4%
Hialeah Market	84	88	85	89	96	90	157	133	156	1.1%	9.0%
Miami Airport	411	427	441	478	477	422	528	583	725	5.1%	2.1%
Total	7,932	8,402	8,661	9,108	9,314	8,652	10,506	11,938	14,198	100.0%	4.3%

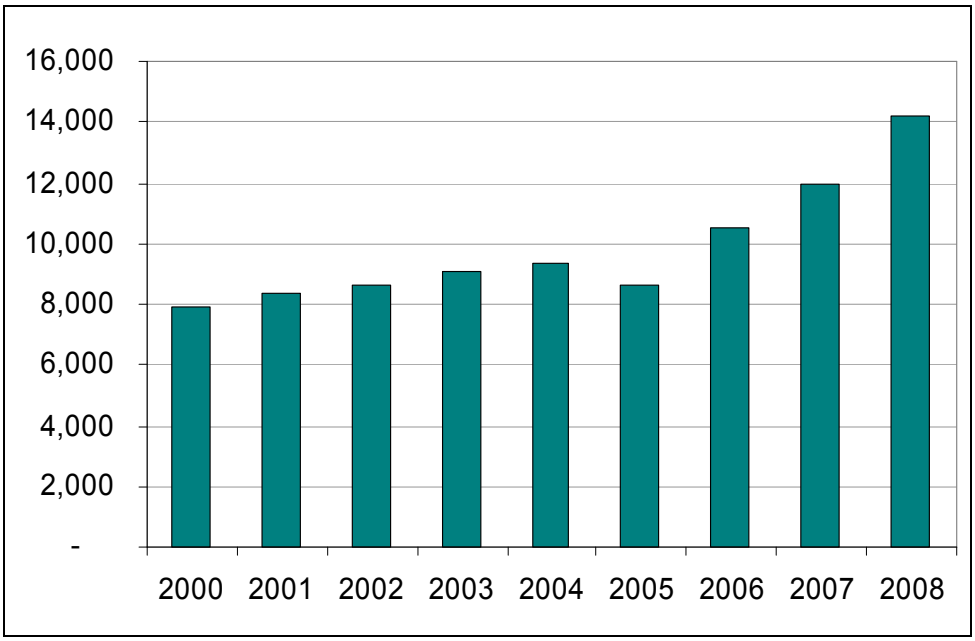

Figure 11: Tri-Rail Average Daily Ridership

Historical Station Parking Demand

Historical parking counts, parking space supply, and parking utilization are shown in Table 12. At each station, parking utilization is defined as (total number of vehicles parked)/(total number of parking spaces provided).

Table 12: Tri-Rail Station Parking

Station	Parking Count						Parking Capacity			Parking Utilization		
	1998	2000	2002	2004	2006	2008	2004	2006	2008	2004	2006	2008
Mangonia Park	44	48	68	78	125	277	273	274	272	29%	46%	102%
West Palm Beach	52	63	86	110	126	166	153	139	114	72%	91%	146%
Lake Worth Station	53	73	74	80	65	206	85	85	225	94%	76%	92%
Boynton Beach	48	72	77	118	103	288	325	330	324	36%	31%	89%
Delray Beach	23	43	37	67	76	129	97	130	129	69%	58%	100%
Boca Raton	43	47	44	50	90	148	57	163	159	88%	55%	93%
Deerfield Beach	59	55	113	207	156	174	242	255	236	86%	61%	74%
Pompano Beach	48	75	73	75	101	193	257	272	259	29%	37%	75%
Cypress Creek Station	148	123	82	75	89	232	556	556	560	13%	16%	41%
Fort Lauderdale	76	113	137	162	90	269	770	394	875	21%	23%	31%
Fort Lauderdale Airport	60	77	100	123	164	171	170	180	183	72%	91%	93%
Sheridan Street	54	104	108	105	152	412	871	475	592	12%	32%	70%
Hollywood	102	122	111	143	128	139	160	141	150	89%	91%	93%
Golden Glades			682	744	946	1,041	1,036	1,036	1,027	72%	91%	101%
Opa Locka Station			27	24	31	76	64	72	72	38%	43%	106%
Metrorail			37	37	37	56	37	41	44	100%	90%	127%
Hialeah Market			8	9	12	78	67	70	123	13%	17%	63%
Miami Airport			49	92	114	135	163	181	143	56%	63%	94%
Total	810	1,015	1,913	2,299	2,605	4,190	5,383	4,794	5,487	43%	54%	76%

Note: Variations were noted among the parking capacity data for 2004, 2006, and 2008. These variations may be due to several reasons, including capacity enhancements (e.g., Lake Worth), temporary closure of parking lots due to maintenance (e.g., Sheridan Street), or differences in data collection methodologies. Please refer to notes under Table 2 for additional information.

Figure 12 illustrates historical total daily parking counts for the period 2000 to 2008.

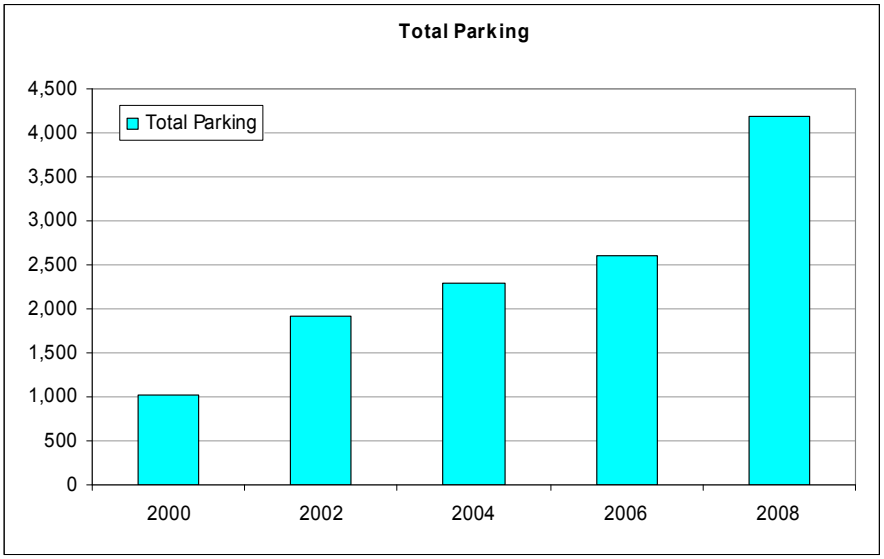

Figure 12: Historical Parking Counts: 2000 to 2008

Historical Parking Ratio

The methodology to develop future parking demand projections was based on the concept of parking ratio, i.e. the number of cars parked per Tri-Rail customer. Parking ratio is defined as (parking demand ÷ ½ ridership). The ridership is halved to account for the assumption that typically one parked vehicle is associated with one customer who makes two daily trips (e.g. to work and return home).

For each station in the system, parking ratios were calculated using the historical parking demand and ridership data. Parking ratio indicates number of vehicles counted at each station as a proportion of ridership at the station and reflects the number of customers that drive to the station and park. Table 13 shows the parking ratios for each station, as well as a system-wide average from 2000 to 2008.

Table 13: Parking Ratio

Stations	Parking					Ridership					Parking Ratio				
	2000	2002	2004	2006	2008	2000	2002	2004	2006	2008	2000	2002	2004	2006	2008
Mangonia Park	48	68	78	125	277	553	591	597	620	946	0.17	0.23	0.26	0.40	0.59
West Palm Beach	63	86	110	126	166	674	868	850	885	1,276	0.19	0.20	0.26	0.28	0.26
Lake Worth Station	73	74	80	65	206	469	527	590	594	788	0.31	0.28	0.27	0.22	0.52
Boynton Beach	72	77	118	103	288	456	504	559	613	824	0.32	0.31	0.42	0.34	0.70
Delray Beach	43	37	67	76	129	324	355	419	450	608	0.27	0.21	0.32	0.34	0.42
Boca Raton	47	44	50	90	148	474	559	581	671	892	0.20	0.16	0.17	0.27	0.33
Deerfield Beach	55	113	207	156	174	391	414	476	521	699	0.28	0.55	0.87	0.60	0.50
Pompano Beach	75	73	75	101	193	388	372	442	530	683	0.39	0.39	0.34	0.38	0.57
Cypress Creek Station	123	82	75	89	232	457	443	478	599	779	0.54	0.37	0.31	0.30	0.60
Fort Lauderdale	113	137	162	90	269	654	641	693	718	1,066	0.35	0.43	0.47	0.25	0.50
Fort Lauderdale Airport	77	100	123	164	171	256	337	399	530	585	0.60	0.59	0.62	0.62	0.59
Sheridan Street	104	108	105	152	412	235	219	243	343	393	0.89	0.99	0.86	0.89	*2.10*
Hollywood	122	111	143	128	139	412	507	533	571	794	0.59	0.44	0.54	0.45	0.35
Golden Glades		682	744	946	1,041	302	335	379	472	576		*4.07*	*3.93*	*4.01*	*3.62*
Opa Locka Station		27	24	31	76	122	139	154	198	229		0.39	0.31	0.31	0.66
Metrorail		37	37	37	56	1,270	1,326	1,349	1,505	2,181		*0.06*	*0.05*	*0.05*	*0.05*
Hialeah Market		8	9	12	78	84	85	96	157	156		0.19	0.19	0.15	*1.00*
Miami Airport		49	92	114	135	411	441	477	528	725		0.22	0.39	0.43	0.37
Total	1,015	1,913	2,299	2,605	4,190	7,932	8,661	9,314	10,506	14,198	0.35	0.34	0.40	0.38	**0.55**

The initial approach to develop future parking projections attempted to develop parking ratios for individual stations and station types – i.e. typical commuter stations and constrained or atypical stations with low parking rates. However, as indicated in Table 13, there is a great deal of variation in this ratio, for both successive years, and for different stations. The same dispersion was evident when stations were segmented by type.

The lack of clear trends in station-specific parking ratios may be explained by parking constraints. In unconstrained conditions, parking ratio describes the relationship between parking demand and ridership. However, if parking supply is constrained (parking utilization close to or over 1.00), riders who intend to drive to one station may drive to an adjacent station where additional parking spaces are available; seek other ways to access the station, such as transit and drop off; or even decide to drive to their destinations instead of using Tri-Rail. For this reason, it was decided by the study team, with the input of Tri-Rail staff, to use a system-wide parking ratio approach. As indicated in the last row in Table 13, this average ratio has been trending up over the period in review, and was calculated at 0.55 in July 2008 when gas prices were at or over $4.00 per gallon. This average was calculated excluding the Golden Glades and Metrorail stations.

The Golden Glades parking lots are shared with other park-n-ride users, making it difficult to distinguish Tri-Rail user parking from other parking. The Metrorail Station serves as a transfer hub between Tri-Rail and Metrorail. Among all Tri-Rail stations, this station has the highest ridership and lowest parking ratio. This situation is mainly due to large number of transfer activities of Tri-Rail riders using Metrorail to travel in and out of Downtown Miami and the Civic Center/Health District.

Future Parking Projections

The development of future parking demand projections was based on a spreadsheet model developed to reflect historical parking trends relying on the regional FFGA Amendment for future ridership forecasts, which are reflective of the population and economic growth in the three counties in which Tri-Rail operates.

A second scenario assumed ridership growth 25 percent faster than specified in the FFGA Amendment to accommodate higher ridership and parking growth due to high gas price increases or other conditions. Ridership projections are shown in Table 14 as a range that covers the FFGA Amendment growth scenario and the additional 25 percent increase.

Parking demand was estimated using the following equation:

$$PD_{ij} = \frac{PR \times \frac{Ridership_{ij}}{2}}{(1 - R\%_j)}$$

where,

PD_{ij}	= parking demand at station j in year i,
$Ridership_{ij}$	= future ridership at station j in year i, as shown in Table 14, note that ridership numbers were rounded to nearest 50,
$R\%_j$	= reserve % at station j, and
PR	= 0.55, the system-wide parking ratio.

Table 14: Future Ridership Projections

Station	Future Ridership			
	2010	2015	2020	2025
Mangonia Park	1100 - 1150	1300 - 1350	1500 - 1650	1700 - 1950
West Palm Beach	1500 - 1550	1750 - 1850	2000 - 2200	2300 - 2650
Lake Worth	900 - 950	1050 - 1150	1250 - 1350	1450 - 1650
Boynton Beach	950 - 1000	1100 - 1200	1300 - 1450	1500 - 1700
Delray Beach	700 - 750	850 - 900	950 - 1050	1100 - 1250
Boca Raton	1050 - 1050	1200 - 1300	1400 - 1550	1600 - 1850
Deerfield Beach	800 - 850	950 - 1000	1100 - 1200	1250 - 1450
Pompano Beach	800 - 800	950 - 1000	1050 - 1200	1250 - 1450
Cypress Creek	900 - 950	1050 - 1150	1200 - 1350	1400 - 1650
Fort Lauderdale	1250 - 1300	1450 - 1550	1650 - 1850	1950 - 2200
Fort Lauderdale Airport	700 - 700	800 - 850	900 - 1000	1050 - 1200
Sheridan Street	450 - 450	550 - 550	600 - 700	700 - 800
Hollywood	950 - 950	1100 - 1150	1250 - 1400	1450 - 1650
Golden Glades	700 - 700	800 - 850	900 - 1000	1050 - 1200
Opa Locka	250 - 300	300 - 350	350 - 400	400 - 500
Metrorail	2550 - 2600	2950 - 3150	3400 - 3800	3950 - 4550
Hialeah Market	200 - 200	200 - 250	250 - 250	300 - 350
Miami Airport	850 - 850	1000 - 1050	1150 - 1250	1300 - 1500
Total	16600 - 17050	19250 - 20500	22200 - 24600	25750 - 29600

Future parking demand and a timeline of new parking spaces needed for each station are shown in Table 15 using a low-high range to reflect the two ridership growth scenarios considered. The projected demand is rounded to the nearest five spaces.

The "Reserve %" is a buffer added to future parking demand in order to minimize the driver's circulation time looking for a space. This approach is consistent with parking facility design and FDOT guidance on park-n-ride facilities. The reserve ratio is set to 5 percent, 10 percent, and 15 percent according to the following guidance:

- Demand < 250 : 15 percent
- Demand between 250 – 500: 10 percent
- Demand > 500 5 percent

Parking demand at Cypress Creek, Fort Lauderdale, Sheridan and Golden Glades stations were calculated based on two individual components: Tri-Rail rider parking demand and park-n-ride user parking demand. Tri-Rail rider parking demand was calculated based on the system-wide parking ratio method shown above with the remainder of vehicles attributed to park-n-ride. Park-n-ride future demand assumed a compound annual growth rate of 3 percent, which is consistent with Tri-Rail ridership growth assumed in the FFGA amendment projections.

At the Metrorail Station, the future demand was capped at 60 new spaces due to limited property at that location along with the propensity for transfers at this station. Additional

parking demand associated with future ridership growth at this station was allocated amongst all other stations.

Summary of Future Parking Projections

The future parking demand forecast indicates a system-wide requirement of approximately 4,700 new parking spaces by 2025. This estimate includes approximately 885 new spaces at Golden Glades, which includes both Tri-Rail and other park-and-ride demand. With the exception of the Cypress Creek and Fort Lauderdale stations, all other stations are shown to require additional parking spaces. The stations with highest demand for additional Tri-Rail parking include West Palm Beach, Boca Raton, Hollywood, and Mangonia Park.

Table 15: Future Parking Demand

Station	08 P. Supply	Parking Ratio	08 P. Demand	Reserve %	08 Proj. Parking	Future Parking Demand				New Parking Needed			
						2010	2015	2020	2025	2010	2015	2020	2025
Mangonia Park	272	0.55	277	10%	260	340 - 345	390 - 415	450 - 500	525 - 600	70 - 80	125 - 150	185 - 235	260 - 340
West Palm Beach	114	0.55	166	5%	351	430 - 445	500 - 535	580 - 640	670 - 770	320 - 335	390 - 425	470 - 535	565 - 670
Lake Worth	225	0.55	206	10%	217	280 - 290	325 - 345	375 - 420	435 - 500	60 - 65	105 - 125	155 - 200	220 - 285
Boynton Beach	324	0.55	288	10%	227	295 - 300	340 - 365	395 - 435	455 - 525	-	20 - 45	75 - 120	140 - 210
Delray Beach	129	0.55	129	10%	167	215 - 225	250 - 270	290 - 320	335 - 385	90 - 95	125 - 140	165 - 200	215 - 265
Boca Raton	159	0.55	148	10%	245	320 - 325	370 - 395	425 - 470	495 - 570	160 - 170	215 - 240	275 - 320	340 - 420
Deerfield Beach	236	0.55	174	10%	192	250 - 255	290 - 310	335 - 370	385 - 445	15 - 20	55 - 75	100 - 140	155 - 215
Pompano Beach	259	0.55	193	10%	188	245 - 250	285 - 300	325 - 360	380 - 435	-	25 - 45	70 - 110	125 - 185
Cypress Creek	560	0.55	232	10%	214	300 - 305	345 - 370	405 - 445	460 - 525	-	-	-	-
Cypress Creek - Tri-Rail					214	278 - 285	322 - 343	372 - 412	431 - 496				
Cypress Creek - P&R					20	21	24	28	33				
Fort Lauderdale	875	0.55	269	5%	293	370 - 380	430 - 455	500 - 550	575 - 660	-	-	-	-
Fort Lauderdale - Tri-Rail					293	360 - 370	417 - 444	482 - 534	559 - 643				
Fort Lauderdale - P&R					10	11	13	15	17				
Fort Lauderdale Airport	183	0.55	171	10%	161	210 - 215	240 - 260	280 - 310	325 - 370	25 - 35	60 - 80	100 - 130	145 - 195
Sheridan Street	592	0.55	412	5%	412	470 - 475	550 - 560	635 - 655	735 - 765	-	-	50 - 70	155 - 185
Sheridan - Tri-Rail					108	133 - 136	154 - 164	178 - 197	206 - 237				
Sheridan - P&R					304	339	393	456	529				
Hollywood	150	0.55	139	10%	218	285 - 290	330 - 350	380 - 420	440 - 505	135 - 145	180 - 205	235 - 275	295 - 365
Golden Glades	1027	0.55	1041	5%	1041	1180 - 1185	1370 - 1385	1585 - 1615	1840 - 1885	165 - 170	355 - 370	580 - 610	840 - 885
Golden Glades - Tri-Rail					158	194 - 199	225 - 240	260 - 289	302 - 347				
Golden Glades - P&R					883	986	1,143	1,325	1,536				
Opa Locka	72	0.55	76	15%	63	85 - 90	100 - 105	115 - 130	135 - 155	15 - 20	30 - 35	45 - 60	65 - 85
Metrorail	44	0.10	56	15%	56	150 - 155	175 - 185	200 - 220	235 - 265	60 - 60	60 - 60	60 - 60	60 - 60
Hialeah Market	123	0.55	78	15%	43	60 - 60	70 - 75	80 - 85	90 - 105	-	-	-	-
Miami Airport	143	0.55	135	10%	199	260 - 265	300 - 320	345 - 385	400 - 460	120 - 125	160 - 180	210 - 245	265 - 325
Total	5487	-	4190	0	4547	5710 - 5830	6620 - 6950	7655 - 8290	8875 - 9890	1235 - 1320	1905 - 2175	2775 - 3310	3845 - 4690

Notes:

- System-wide parking ratio was developed from July 2008 ridership and parking counts.
- Reserve % was applied to provide buffer spaces in Tri-Rail parking lot to minimize circulation time.
- Future parking demand estimated by (Parking Ratio)*(Future Ridership/2)/(1-Reserve%). Assumes 1customer makes 2 daily trips
- New Parking Needed is calculated by (Future Parking Demand - 08 Parking Supply), rounded to closest 5. "-" indicates that current supply meets future parking needs.
- 2008 parking projection was calculated by applying the parking ratio to the ridership of each station.
- For Cypress Creek, Sheridan, and Golden Glades stations, 2008 P&R parking demands were estimated as [(08 parking demand) -(08 Tri-Rail parking projection)].
- For Fort Lauderdale station, assumed there are 10 P&R users parking at the station.
- Grey cells show the separate component of Tri-Rail users and P&R users, while blue cells indicate combined demand at stations with large park-and-ride lots.
- Future parking demands are calculated assuming no constraint on parking provision (except Metrorail).

The resulting number of new parking spaces that should be provided at each station over the next 20 years to address the anticipated growth in ridership is shown in Table 16.

Table 16: Tri-Rail Parking Needs

Tri-Rail Future Parking Needs					
	2025 Demand	minus	Existing	equals	Need
Mangonia Park	525 - 600	-	272	=	260 - 340
West Palm Beach	670 - 770	-	114	=	565 - 670
Lake Worth	435 - 500	-	225	=	220 - 285
Boynton Beach	455 - 525	-	324	=	140 - 210
Delray Beach	335 - 385	-	129	=	215 - 265
Boca Raton	495 - 570	-	159	=	340 - 420
Deerfield Beach	385 - 445	-	236	=	155 - 215
Pompano Beach	380 - 435	-	259	=	125 - 185
Cypress Creek**	460 - 525	-	560	=	0*
Fort Lauderdale**	575 - 660	-	875	=	0*
Fort Lauderdale/Hollywood International Airport	325 - 370	-	183	=	145 - 195
Sheridan Street**	735 - 765	-	592	=	155 - 185
Hollywood	440 - 505	-	150	=	295 - 365
Golden Glades**	1840 - 1885	-	1027	=	840 - 885
Opa-Locka	135 - 155	-	72	=	65 - 85
Tri-Rail/Metrorail Transfer	235 - 265	-	44	=	60 - 60
Hialeah Market	90 - 105	-	123	=	0*
Miami Airport	400 - 460	-	143	=	265 - 325
	8875 - 9890		5487		3845 - 4690

*Current capacity accommodates 2025 demand. Please note that the demand at these stations only represents Tri-Rail parking needs and does not include additional parking needs of carpools, bus riders, etc.

** Inlcudes both Tri-Rail and non-Tri-Rail parking demand and capacity.