

Reporting and Analytical Summary Functionality

Technical Memorandum 6

Contents

1 Introduction	2
2 Trip Generation Reporting	2
3 Trip Distribution Reporting	5
4 Model Choice Reporting	7
5 Assignment Reporting	8

Table of Figures

Figure 2-1: Sample Trip Generation Report Histogram	4
Figure 3-1: Enhanced TLF chart	5
Figure 4-1: Mode Choice Regional Summary Example	7
Figure 5-1: HEVAL Sample Report	8
Figure 5-2: TAREPORT Example Assignment Summary	10
Figure 5-3: TAREPORT Example Transit Line Summary	10

List of Tables

Table 2-1 Trip Production Report -- Sample	2
Table 2-2: Script for Trip Gen Reporting	3
Table 2-3: Example of a Land Use Error Summary Report	4
Table 3-1: Sample Standard CUBE Trip Length Frequency Distribution	6
Table 3-2: Example of Distribution District Summary	7

1 Introduction

The purpose of the Transit Modeling Update project is to specify, within the Florida Standard Urban Transportation Modeling System (FSUTMS) and associated support systems, the changes necessary to improve the preparation of transit demand forecasts to a point consistent with federal expectations, and to incorporate state of the practice techniques and tools through a prototype model application. The Tallahassee Capital Region Transportation Planning Agency (CRTPA) model was chosen as the prototype FSUTMS model application.

In this document, the FSUTMS reporting requirements will be described. Standard reports from the model allow the user to quickly assess overall performance measures, compare results with other model runs, and spot potential errors or illogical results. Therefore a comprehensive set of summary reports is essential to ensure that the model outputs are adequately reviewed and checked for quality and reasonableness.

The following chapters will address model output reports for each of the major model steps – trip generation (Chapter 2); Trip Distribution (Chapter 3), Mode Choice (Chapter 4) and Assignment (Chapter 5). Current FSTUMS reports will be retained wherever possible to aid in continuity and user familiarity. New reports may be required to accommodate the new FSTUMS standard model procedures.

2 Trip Generation Reporting

The trip generation step generates three primary summary reports.

The first report is a generation summary. It contains a list of productions, unbalanced attractions and balanced attractions by purpose. This report should remain, but in addition, the ratio of the unbalanced attractions to the unbalanced productions should be added for each purpose. Table 2-1 shows an example of this output, and Table 2-2 shows the associated script in the trip generation step.

Table 2-1 Trip Production Report -- Sample

TRIP PRODUCTION AND ATTRACTION REPORT BY PURPOSE						
Purpose= 1	Productions=	306,946	Unbalanced	Attractions=	321,235	A/P ratio = 1.05
Purpose= 2	Productions=	191,932	Unbalanced	Attractions=	200,106	A/P ratio = 1.04
Purpose= 3	Productions=	181,839	Unbalanced	Attractions=	193,308	A/P ratio = 1.06
Purpose= 4	Productions=	479,978	Unbalanced	Attractions=	488,641	A/P ratio = 1.02
Purpose= 5	Productions=	474,620	Unbalanced	Attractions=	474,620	A/P ratio = 1.00
Purpose= 6	Productions=	160,010	Unbalanced	Attractions=	160,010	A/P ratio = 1.00
Purpose= 7	Productions=	153,026	Unbalanced	Attractions=	153,013	A/P ratio = 1.00
Total=	Productions=	1,948,351	Unbalanced	Attractions=	1,990,933	A/P ratio = 1.02
Purpose= 1	Productions=	306,946	Balanced	Attractions=	306,946	
Purpose= 2	Productions=	191,932	Balanced	Attractions=	191,932	
Purpose= 3	Productions=	181,839	Balanced	Attractions=	181,839	
Purpose= 4	Productions=	479,978	Balanced	Attractions=	479,978	
Purpose= 5	Productions=	474,620	Balanced	Attractions=	474,620	
Purpose= 6	Productions=	160,010	Balanced	Attractions=	160,010	
Purpose= 7	Productions=	153,026	Balanced	Attractions=	153,026	
Total=	Productions=	1,948,351	Balanced	Attractions=	1,948,351	

Table 2-2: Script for Trip Gen Reporting

```
TOTP=0
TOTA=0
LOOP PURP=1,7

  TOTP=TOTP+P[PURP][0]
  TOTA=TOTA+A[PURP][0]

  IF (PURP=1) PRINT LIST="TRIP PRODUCTION AND ATTRACTION REPORT BY PURPOSE", PRINTO=1
    pratio = a[purp][0]/p[purp][0]
    PRINT LIST=" Purpose=",PURP(2.0)," Productions=",P[PURP][0](12.0C)," Unbalanced
Attractions=",A[PURP][0](12.0C)," A/P ratio = ",pratio(5.2) PRINTO=1
  ENDLLOOP
  pratio = TOTA/TOTP
  PRINT LIST=" Total=", " Productions=",TOTP(12.0C)," Unbalanced
Attractions=",TOTA(12.0C)," A/P ratio = ",pratio(5.2) PRINTO=1

BALANCE A2P=1-4,7
BALANCE P2A=5-6

TOTPP=0
TOTAA=0

LOOP PURP=1,7
  P[PURP]=ROUND(P[PURP])
  A[PURP]=ROUND(A[PURP])

  TOTPP=TOTPP+P[PURP][0]
  TOTAA=TOTAA+A[PURP][0]

  PRINT LIST=" Purpose=",PURP(2.0)," Productions=",P[PURP][0](12.0C)," Balanced
Attractions=",A[PURP][0](12.0C), PRINTO=1
  ENDLLOOP
  PRINT LIST=" Total=", " Productions=",TOTPP(12.0C)," Balanced
Attractions=",TOTAA(12.0C), PRINTO=1

LOOP tt=1,{ZONESI}
  LOOP PRPS=1,7
    P[8][tt]=P[8][tt]+P[PRPS][tt]
    A[8][tt]=A[8][tt]+A[PRPS][tt]
  ENDLLOOP
ENDLOOP
```

The second report lists errors in the input socioeconomic data where population is less than the number of households. This reports the zone where this occurs and the values of population and household for that zone. This should remain and is essential so that the household size distribution can be properly estimated.

The third report is a land use check summary that lists a count of the zones that have various logical errors with regard to household size, employment and auto ownership. There is an advisory to check the land use file in case of errors. Table 2-3 shows an example of this report.

Additional reports in line with the new recommendations for trip generation include regional summaries for the following measures:

- trips/household,
- trips/person
- work trips/job
- Autos/household

Table 2-3: Example of a Land Use Error Summary Report

```

LAND USE ERROR CHEKING
CHECK LISTED ZONES IN ZONEDATA_00B FILES FOR THE FOLLOWING ERRORS!!!

*****Error Report Summary*****
TOTAL AUTO OWNERSHIP ERRORS FOR SINGLE FAMILY=          0
TOTAL AUTO OWNERSHIP ERRORS FOR MULTI FAMILY=           0
TOTAL MORE DU THAN PEOPLE ERRORS FOR SINGLE FAMILY=     0
TOTAL MORE DU THAN PEOPLE ERRORS FOR MULTI FAMILY=      0
TOTAL EMPLOYMENT CATEGORIES ERRORS=                     0

THERE ARE NO AUTO OWNERSHIP = 0 BUT POPULATION > 0 ERRORS

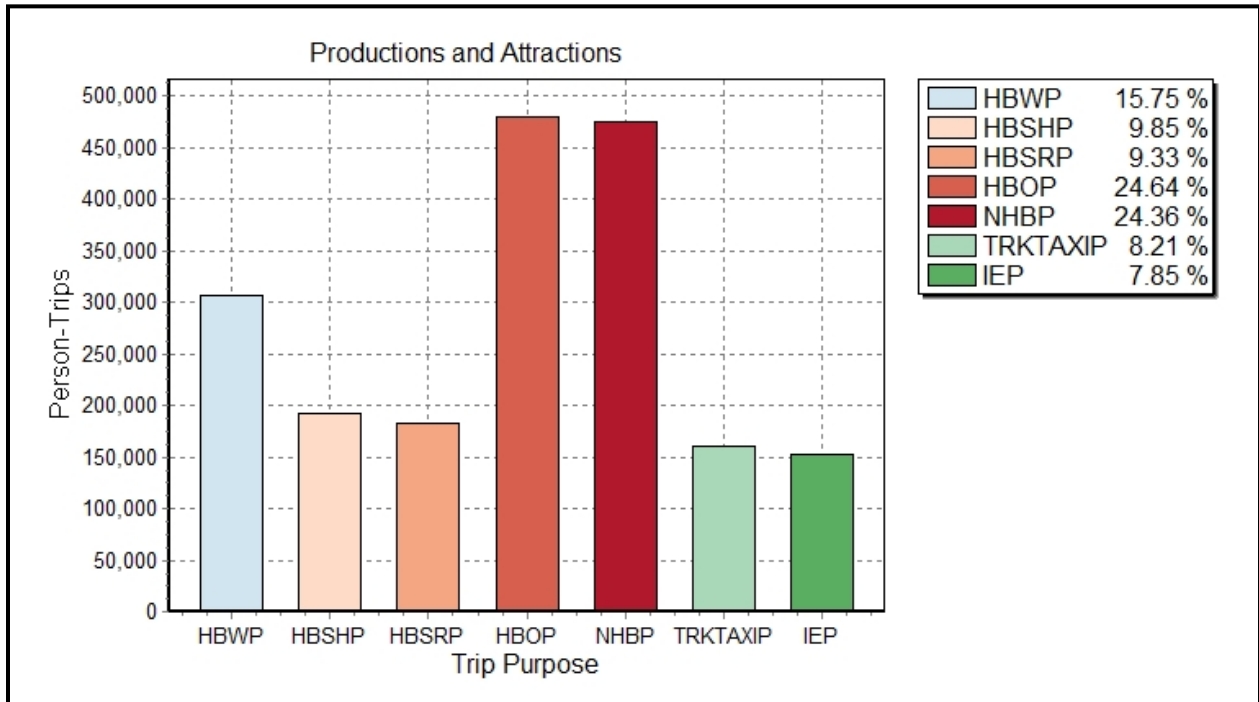
THERE ARE NO OCCUPIED DU WITHOUT ENOUGH POP ERRORS

THERE ARE NO EMPLOYMENT CATEGORIES ERRORS
    
```

Finally, the report-building function of CUBE can be used to generate graphic summaries.

One recommended summary is a histogram of trips by purpose, showing totals and relative shares by purpose, as shown in Figure 2-1. This allows the analyst to quickly view the relative size of the trips by purpose and compare them with standards. This file should use the PANDA_{alt}{year}.dbf file.

Figure 2-1: Sample Trip Generation Report Histogram



Trip Distribution Reporting

The trip distribution step currently reports trip length frequency distributions for each trip purpose. is a standard report, shown in

Table 0-1 and should continue to be included. Note that in addition to the distribution itself, the number of intra-zonal trips (identified by @I=J) and the mean trip length frequency should also be noted. These summaries are listed at the end of each standard trip length frequency report.

An enhanced, more easily readable trip length frequency distribution could be added through the CUBE reports function. This would require an additional matrix step to read the trip files and input impedance files to create a database file which has the impedance distribution and the total number of trips. This file could then be referenced by the CUBE reports function to create a more easily-readable graphic as shown in Figure 0-1.

Finally, a district summary of the trip tables should be generated, using no more than 15 pre-defined districts. An example is shown in Table 0-2. The districts should be easily recognizable, and follow political (i.e., cities and counties), area type (i.e., CBD) and/or natural boundaries (i.e., rivers, rail lines, etc.). Separate districts should be identified for external zones and unused zones. Generating this type of summary will allow the analyst to quickly evaluate overall travel patterns in the region.

Figure 0-1: Enhanced TLF chart

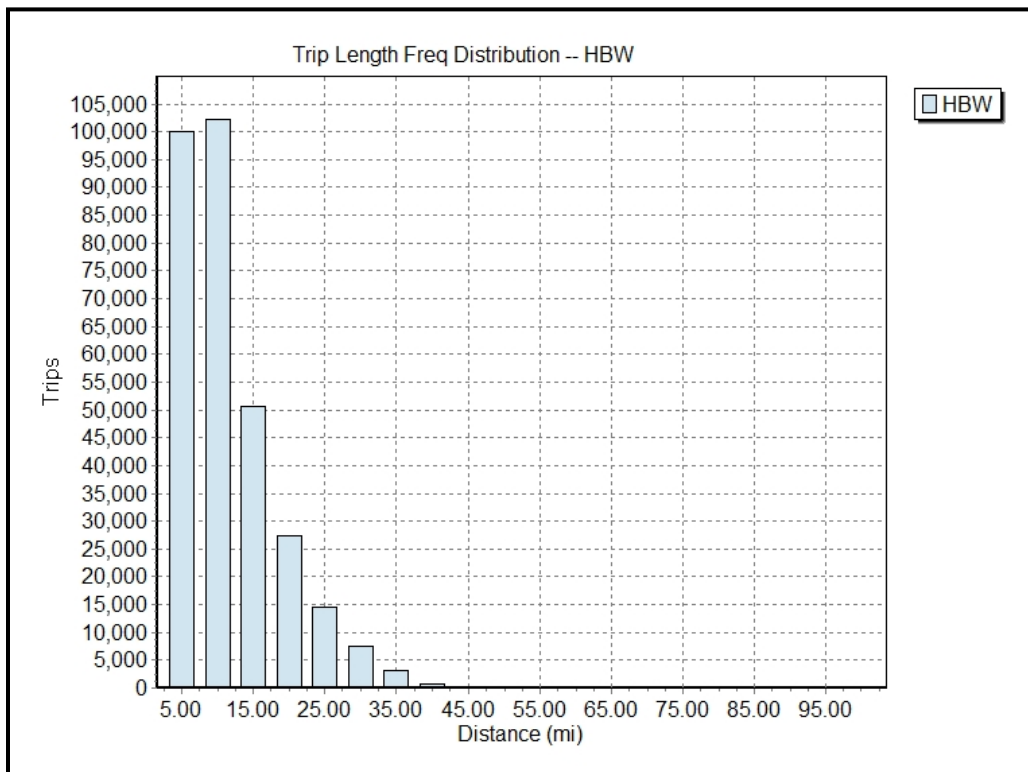


Table 0-1: Sample Standard CUBE Trip Length Frequency Distribution

FREQUENCY (Iter=32) HBW TLFD						
BASEMW=50 VALUEMW=1 RANGE=0,70,1						
MW[50]						
>=	-	<	Obs	Sum	Pct	Accum Pct
2.0	-	3.0	121	363.31	0.1	0.1
3.0	-	4.0	677	1,882.52	0.6	0.7
4.0	-	5.0	1,284	4,698.72	1.5	2.3
5.0	-	6.0	2,179	8,236.22	2.7	4.9
6.0	-	7.0	3,073	11,766.98	3.8	8.8
7.0	-	8.0	4,124	12,738.50	4.2	12.9
8.0	-	9.0	5,040	16,644.13	5.4	18.4
9.0	-	10.0	5,617	17,196.02	5.6	24.0
10.0	-	11.0	5,934	18,226.15	5.9	29.9
11.0	-	12.0	5,778	17,001.82	5.5	35.4
12.0	-	13.0	5,831	18,366.32	6.0	41.4
13.0	-	14.0	5,769	16,326.63	5.3	46.7
14.0	-	15.0	5,693	13,900.86	4.5	51.3
15.0	-	16.0	6,010	14,526.18	4.7	56.0
16.0	-	17.0	5,989	12,582.86	4.1	60.1
17.0	-	18.0	5,900	10,733.45	3.5	63.6
18.0	-	19.0	5,879	9,795.84	3.2	66.8
19.0	-	20.0	6,450	9,745.89	3.2	70.0
20.0	-	21.0	6,996	8,560.60	2.8	72.7
21.0	-	22.0	7,295	7,797.61	2.5	75.3
22.0	-	23.0	8,131	6,708.65	2.2	77.5
23.0	-	24.0	7,851	6,282.81	2.0	79.5
24.0	-	25.0	8,386	5,747.61	1.9	81.4
25.0	-	26.0	8,321	5,196.76	1.7	83.1
26.0	-	27.0	8,392	5,148.31	1.7	84.8
27.0	-	28.0	8,369	4,749.01	1.5	86.3
28.0	-	29.0	7,723	4,356.34	1.4	87.7
29.0	-	30.0	7,617	3,878.05	1.3	89.0
30.0	-	31.0	7,363	3,888.09	1.3	90.3
31.0	-	32.0	7,228	3,487.37	1.1	91.4
32.0	-	33.0	7,193	3,283.65	1.1	92.5
33.0	-	34.0	6,664	3,063.70	1.0	93.5
34.0	-	35.0	6,666	2,617.56	0.9	94.3
.
.
.
67.0	-	68.0	483	12.18	0.0	100.0
68.0	-	69.0	336	9.80	0.0	100.0
69.0	-	70.0	315	6.76	0.0	100.0
70.0+			1,758	51.92	0.0	100.0

Total Obs = 294,930
Total Sum = 306,946
Mean = 17.05
@I=J = 9,525.54

Table 0-2: Example of Distribution District Summary

A									
✓ *1 hbw	2 hbsh	3 hbsr	4 hbo	5 nhb	6 trktaxi	7 intext			
Sum	1	2	3	4	5	6	7	8	
306937	78500	103256	66566	28494	7729	8746	0	13646	
1 59295	33799	5554	12325	6522	180	22	0	893	
2 103834	9054	73434	11350	2772	2410	2057	0	2757	
3 65517	16901	8332	35725	2320	69	1346	0	824	
4 47925	17859	4096	5063	15670	1110	17	0	4110	
5 17204	799	6665	255	1187	3918	52	0	4328	
6 13162	88	5175	1848	23	42	5252	0	734	
7 0	0	0	0	0	0	0	0	0	
8 0	0	0	0	0	0	0	0	0	

3 Model Choice Reporting

The mode choice model, if implemented with CUBE script (i.e., through the XCHOICE command) a summary is reported showing regional mode totals and relative shares, as well as auto occupancy. Figure 3-1 shows an example of this report, which is repeated for the remaining purposes.

Figure 3-1: Mode Choice Regional Summary Example

```

+++++ MODE XCHOICE SUMMARY +++++

Olympus 3.0
Base

HBW - PK MODE XCHOICE RESULTS
HBW TOTAL                = 306,939  1.0000
DRIVE ALONE              = 244,376  0.7962
HOV2                    =  51,606  0.1681
HOV3+                   =   9,694  0.0316
WALK TO TRANSIT         =   1,222  0.0040
PNR TO TRANSIT          =         21  0.0001
KNR TO TRANSIT          =         20  0.0001
Average Auto Occupancy  =1.12

COEFFICIENTS                HBW
IN VEHICLE TIME            =-0.02000
COMMUTER RAIL TIME         =-0.01600
OUT OF VEHICLE TIME        =-0.04000
NUMBER OF TRANSFERS        =-0.10000
OPERATING COST              =-0.00300
    
```


Other summaries may be available if the mode choice model uses a stand-alone program. In any case, other mode choice summaries that are useful include the following:

1. Summary of trips by income and/or auto ownership groups
2. Summary of transit trips by district – matrix format
3. Summary of available trips for transit – this accounts for transit accessibility effects
4. Trip length frequency distribution for transit trips

These summaries can be easily generated by trip purpose using the mode choice output. Available trips will require estimating trip availability indices for each mode and sub-mode. District summaries should use the same district equivalence file used for the trip distribution summaries.

The reports are used to evaluate the ability of the model to measure mode choice sensitivities at more detailed market levels, such as by socio-economic group or by geography.

4 Assignment Reporting

Highway assignment reporting uses the HEVAL procedure to generate key regional summaries of the loaded network performance. These values include network summaries, Vehicle-Miles (VMT) and Vehicle-Hours (VHT) of travel, comparison to counts and original and congested speeds. Figure 4-1 shows an example of this report.

Figure 4-1: HEVAL Sample Report

Total Number of Links:	4,479	
Total Lane Miles:	2,642.64	
Total Directional Miles:	2,015.00	
Total VMT using Volumes:	4,089,220	(Links With Counts)
Total VMT using Counts:	4,181,837	(Links With Counts)
Total VMT Volume over Counts:	0.98	(Links With Counts)
Total VHT using Volumes:	113,545	(Links With Counts)
Total VHT using Counts:	115,180	(Links With Counts)
Total VHT Volume over Counts:	0.99	(Links With Counts)
Total Volumes All Links:	29,878,197	
Total VMT All Links:	12,689,145	
Total VHT All Links:	357,383	
Original Speed (MPH):	43.87	
Congested Speed (MPH):	40.62	

Other summaries that are recommended include:

1. VMT and VHT by facility type, as well as weighted average speed (VMT/VHT)
2. Delay by facility type, where delay is measured as congested VHT- free-flow VHT
3. VMT by Delay range and by volume/capacity ratio range

These measures will help the analyst to evaluate between alternatives at a regional level. This is particularly important when quantifying effects of long-range, system-wide plans.

Transit assignments use the stand-alone program, TAREPORT, to summarize transit demand on the network.

TAREPORT produces two types of reports:

1. A system summary, which gives total boardings and maximum loads for each line. Figure 4-2 shows an example of this report, which summarizes both peak and off-peak totals
2. A line summary, showing detailed boardings and alightings by stop for each line. Figure 4-3 shows an example of a portion of this report.

Note that TAREPORT can accommodate data from multiple time periods and access modes, which is necessary to accommodate the expanded transit assignment procedures recommended by this update.

Additional recommended transit assignment summaries include the following:

1. Display boardings and alightings on the network through the "Transit On/Off" feature in CUBE when a loaded network is active
2. Display total link loadings by using the LINKO keyword "ONELINKREC=T" to sum all transit loadings to links. The resulting link database can then be merged with the highway network to allow bandwidth displays in CUBE.

Figure 4-2: TAREPORT Example Assignment Summary

Transit Assignment Summary Report
01-12-2011 15:54:13.132

Route Name	Mode	Optr	Dist (mi)	Peak					Off-peak					Daily				Route	LongName	
				Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Pax	MaxLd			PaxMi
Rt10 Shuttle	31	1	4.18	8.91	60.0	20.7	14.3	41.8	1.4	7.05	60.0	58.1	36.8	125.9	3.5	78.9	36.8	167.7	4.9	Rt 10 Shuttle
Rt11 E Main	31	1	14.99	26.86	60.0	80.5	52.0	523.9	15.7	23.55	60.0	186.7	107.8	1237.6	32.5	267.1	107.8	1761.5	48.2	Rt 11 E Main CombeeRd
Rt20 GrovePk	31	1	16.48	28.83	60.0	66.3	32.9	305.3	9.3	25.02	60.0	155.7	69.7	765.6	19.4	222.0	69.7	1070.9	28.7	Rt 20 Grove Pk Crys Lk
Rt21 Edgewd	31	1	17.15	30.72	60.0	73.3	37.9	289.9	8.9	24.25	60.0	165.6	71.4	668.1	16.3	238.9	71.4	958.0	25.2	Rt 21 Edgewood
Rt52 N FlaAv	31	1	15.27	29.64	30.0	179.3	110.0	693.2	23.9	23.96	30.0	462.8	242.1	1841.6	50.0	642.1	242.1	2534.8	73.9	Rt 52 N Fla Ave

Mode-Level Summary

Route Name	Mode	Optr	Dist (mi)	Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Pax	MaxLd	PaxMi	PaxHr	Route	LongName
Mode 21	21		271.78	613.21		337.8		1724.1	72.9	545.20		879.2		4304.4	157.5	1217.1		6028.5	230.4		
Mode 31	31		286.19	485.88		1496.8		6598.1	199.5	423.97		3470.1		14892.9	379.6	4966.9		21491.0	579.1		
All Modes			557.97	1099.09		1834.6		8322.2	272.4	969.17		4349.4		19197.2	537.1	6184.0		27519.4	809.5		

Operator-Level Summary

Route Name	Mode	Optr	Dist (mi)	Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Time (min)	Freq (min)	Pax	MaxLd	PaxMi	PaxHr	Pax	MaxLd	PaxMi	PaxHr	Route	LongName
Operator 1	1		286.19	485.88		1496.8		6598.1	199.5	423.97		3470.1		14892.9	379.6	4966.9		21491.0	579.1		
Operator 2	2		271.78	613.21		337.8		1724.1	72.9	545.20		879.2		4304.4	157.5	1217.1		6028.5	230.4		
All Operators			557.97	1099.09		1834.6		8322.2	272.4	969.17		4349.4		19197.2	537.1	6184.0		27519.4	809.5		

Figure 4-3: TAREPORT Example Transit Line Summary

Transit Assignment Route-Level Report
01-12-2011 15:54:13.132

Route name : Rt10 Shuttle
Long name : Rt 10 Shuttle
Mode: 31 Operator: 1 Peak Freq: 60.00 Off-peak Freq: 60.00

Node	Dist (mi)	CumDist (mi)	Peak					Off-peak					Daily		
			Time (min)	CumTime (min)	On	Off	Load	Time (min)	CumTime (min)	On	Off	Load	On	Off	Load
2849	0.04	0.04	0.08	0.08	14.0	0.0	14.0	0.08	0.08	34.9	0.0	34.9	48.9	0.0	48.9
-2886	0.04	0.08	0.08	0.16	0.0	0.0	14.0	0.08	0.16	0.0	0.0	34.9	0.0	0.0	48.9
2909	0.04	0.12	0.08	0.24	0.0	0.0	14.0	0.08	0.24	0.0	0.1	34.8	0.0	0.1	48.9
-2922	0.04	0.16	0.08	0.32	0.0	0.0	14.0	0.08	0.32	0.0	0.0	34.8	0.0	0.0	48.9
2949	0.05	0.21	0.11	0.43	0.3	0.0	14.3	0.10	0.42	0.6	0.1	35.3	0.9	0.2	49.6
-2968	0.04	0.25	0.08	0.51	0.0	0.0	14.3	0.08	0.50	0.0	0.0	35.3	0.0	0.0	49.6
Totals		4.18		8.91		20.7	14.3		7.05		58.1	36.8		78.9	36.8

Passenger Miles 41.80 125.86 167.66
Passenger Hours 1.42 3.51 4.93
Ave Trip Length (miles) 2.02 2.16 2.13
Ave Trip Length (minutes) 4.11 3.62 3.75