Worksheets for Submitting Performance Measure Data and Reporting Experience

Worksheets Include:

Travel Time – Facility

Travel Time – Reliability (Buffer Time Index)

Travel Time – Facility

Study Area –
The study area is the Metropolitan Atlanta freeway network covered by the Georgia NaviGAtor system. Travel times are obtained for roadway segments on the freeway network only. Arterial and local roads are not included in the computations due to the unavailability of data for those roadways. This system is split into 16 bidirectional segments for the purposes of generating this travel time measure. Coverage is determined by the functioning NaviGAtor infrastructure across the Metropolitan Atlanta freeway system as depicted on Figure 1 on page B-2.

Study Period –
Travel times are generated for two 4-hour periods covering the morning peak period (6:00 a.m. to 10:00 a.m.) and evening peak period (3 p.m. to 7 p.m.) for each day. An average travel time value is obtained for each 15-minute period during these 4 hours. Weekdays and weekends are separated out for the computations. Holidays are not included in the computations.

Sample Size –
The Georgia NaviGAtor cameras are strategically placed to monitor speeds and volumes, with each camera taking a measurement every 20 seconds. As many as 1.5 billion measurements are taken by these cameras each year. The measurements are examined and aggregated into 15-minute intervals for the morning and evening peak period for the weekdays only.

Deviations or exceptions -
No deviations or exceptions from the definition of this measure as provided by the study. Note that the travel times are obtained via processing of speed information from the video captures obtained from the Georgia NaviGAtor video cameras.

Cost Estimates -
The cost of processing the already archived traffic speed and volume information acquired by the Georgia NaviGAtor is about $12,000 in consultant fees and 80 hours staff time annually. Only about 25 percent of this cost is directly attributable to the travel time measure. The NaviGAtor's capital and maintenance cost attributable to this data collection process is unknown and impossible to estimate. However this type of cost may be considered "sunk" cost since the NaviGAtor system is already in place, collects and archives this type of data anyway.

Utility of Performance Measure -
The travel time performance measure is included in the annual Transportation MAP Report that tracks the state of the Metropolitan Atlanta transportation system. The measure is also included as an information item for travelers using the Atlanta freeway system on the Georgia NaviGAtor web site under "Historical Trip Times" accessible online at
http://www.georgia-navigator.com/histdata/trip.shtml

Travel Time Data Collected and Calculated Travel Time
(Sample for 2006, morning peak period from 6 a.m. to 8 a.m.)

Metro Atlanta Interstate Travel Times
2006
AM Peak (6:00 AM - 10:00 AM) Weekdays

Travel Times (Minutes:Seconds) | Volumes (Vehicles per 15 minutes)

Segment Description	Segment Length (miles)	35 mph TT	45 mph TT	55 mph TT	6:00 TT	6:00 Vol	6:15 TT	6:15 Vol	6:30 TT	6:30 Vol	6:45 TT	6:45 Vol	7:00 TT	7:00 Vol	7:15 TT	7:15 Vol	7:30 TT	7:30 Vol	7:45 TT	7:45 Vol
1: I-75 NB (from I-285 to Wade Green Road)	14.00	23:59	18:39	15:16	12:40	8359	12:36	10797	12:34	13091	12:30	13945	12:31	14244	12:31	16345	12:35	17881	12:34	18306
1: I-75 SB (from Wade Green Road to I-285)	14.55	24:56	19:23	15:52	13:20	21902	15:43	25940	19:12	26080	21:39	25559	23:39	25342	25:47	25013	26:35	24693	26:06	24559
2: I-75 NB (from I-85 to I-285)	8.45	14:29	11:16	09:13	07:27	2813	07:32	3425	07:38	4001	07:35	4257	07:32	4578	07:34	5306	07:35	5825	07:32	6251
2: I-75 SB (from I-285 to I-85)	7.86	13:28	10:28	08:34	07:32	7707	07:26	8823	07:29	9435	07:32	9841	07:30	10173	07:42	11070	07:55	11762	08:06	11450
3: I-75/I-85 NB (from I-20 to I-85)	4.41	07:33	05:52	04:48	04:10	8187	04:24	9699	04:47	10237	05:06	10170	05:20	10103	05:41	10036	05:58	9957	06:08	9582
3: I-75/I-85 SB (from I-85 to I-20)	4.40	07:32	05:51	04:47	04:48	5671	04:45	6669	04:44	7372	04:44	7460	04:47	7340	04:54	7606	05:02	7653	05:10	7357
4: I-75 NB (from I-85 to I-20)	3.88	06:39	05:10	04:13	03:21	6303	03:33	8005	04:03	8963	05:05	8825	05:45	8527	06:53	8100	08:02	7568	09:06	7020
4: I-75 SB (from I-20 to I-85)	3.75	06:25	05:00	04:05	03:20	5076	03:22	6077	03:22	6595	03:25	6652	03:27	6610	03:29	6894	03:30	7182	03:31	7431
5: I-75 NB (from I-285 to I-85)	4.00	06:51	05:20	04:21	03:50	4560			03:52	6136	03:51	6147	03:54	6536	03:59	6670	04:02	6851	04:03	6572
5: I-75 SB (from I-85 to I-285)	4.12	07:03	05:29	04:29	04:10	2048	04:08	2406	04:05	2574	04:01	2665	03:59	2622	03:58	2819	03:56	2993	03:57	3043
6: I-75 NB (from Hudson Bridge Road to I-285)	14.53	24:54	19:22	15:51	11:21	8628	11:32	10967	12:22	11618	13:12	11882	13:03	12246	13:15	13279	13:23	13528	13:13	13275
6: I-75 SB (from I-285 to Hudson Bridge Road)	14.45	24:46	19:15	15:45	12:45	4471	12:41	5937	12:39	7449	12:34	7746	12:32	7974	12:29	8835	12:28	9665	12:24	9910
7: I-85 NB (from I-285 to Old Norcross Road)	10.71	18:21	14:16	11:41	10:15	14603	10:11	17759	10:13	20162	10:17	19665	10:19	19024	10:29	20620	10:49	22183	11:01	22952
7: I-85 SB (from Old Norcross Road to I-285)	10.66	18:16	14:12	11:37	09:52	25248	10:58	29518	12:42	29769	14:27	28691	15:57	28034	17:19	27312	18:28	26979	18:15	26619
8: I-85 NB (from I-75 to I-285)	9.96	17:04	13:16	10:51	09:41	13232	09:37	15046	09:35	16331	09:35	16579	09:38	17497	09:41	18627	09:46	19966	09:48	20272
8: I-85 SB (from I-285 to I-75)	10.45	17:54	13:56	11:24	10:38	15766	10:38	18958	10:45	21083	10:51	21390	11:00	22106	11:20	23539	11:52	24447	12:31	24249
9: I-85 NB (from Camp Creek Parkway to I-75)	4.86	08:19	06:28	05:18	04:46	3765	04:46	4597	04:48	5269	04:38	5416	04:35	5567	04:41	5832	04:46	5808	04:45	5353
9: I-85 SB (from I-75 to Camp Creek Parkway)	4.20	07:11	05:35	04:34	03:50	2773	03:50	3200	03:48	3475	03:46	3464	03:45	3365	03:44	3456	03:44	3522	03:45	3572
10: GA-400 NB (from I-285 to Old Milton Parkway)	13.14	22:31	17:31	14:20	12:28	414	12:36	502	12:44	755	12:58	1074	13:24	1225	13:52	1317	15:24	1481	18:58	1521
10: GA-400 SB (from Old Milton Parkway to I-285)	13.16	22:33	17:32	14:21	12:32	743	12:58	1072	13:58	1420	15:23	1649	17:20	1732	21:04	1712	25:22	1682	27:46	1655
11: I-285 EB (from I-75 to GA-400)	6.82	11:41	09:05	07:26	05:56	8109	06:11	11176	06:34	13305	07:10	13830	07:52	13934	08:49	13852	09:15	13882	09:10	13613
11: I-285 WB (from GA-400 to I-75)	7.21	12:21	09:36	07:51	06:23	6264	06:29	8440	06:35	10137	06:39	10861	06:47	11612	06:49	12579	06:47	13268	06:46	13134
12: I-285 EB (from GA-400 to I-85)	6.48	11:06	08:38	07:04	05:54	5813	05:59	7725	06:05	9125	06:05	9602	06:08	9931	06:11	10618	06:12	11365	06:10	11164
12: I-285 EB (from I-85 to GA-400)	6.37	10:55	08:29	06:56	05:56	8203	06:17	11534	06:50	13484	07:44	14013	08:21	14129	09:18	14162	10:05	13968	10:43	13622
13: I-285 NB (from US-78 to I-85)	5.37	09:12	07:09	05:51	05:18	5621	05:39	7693	06:23	9598	07:01	9964	07:24	9958	08:01	10047	08:40	9798	09:01	9595
13: I-285 SB (from I-85 to US-78)	5.89	10:05	07:51	06:25	05:33	1835	05:35	2647	05:42	3396	05:38	3834	05:37	4151	05:37	4687	05:33	5017	05:36	5368
14: I-285 NB (from I-20 to US-78)	8.20	14:03	10:55	08:56	07:57	8397	08:30	11481	09:45	13809	11:34	13371	12:20	12577	13:14	12366	15:02	11541	15:20	11253
14: I-285 SB (from US-78 to I-20)	7.45	12:46	09:55	08:07	06:51	3393	06:55	4936	06:58	6511	07:01	7317	07:02	7569	07:10	8812	07:15	9766	07:16	9960
15: I-20 EB (from I-285 to I-75/I-85)	6.43	11:01	08:34	07:00	05:30	4618	05:36	5304	05:39	5759	05:40	5961	05:50	6281	06:00	7034	06:03	7599	06:11	7685
15: I-20 WB (from I-75/I-85 to I-285)	7.12	12:12	09:29	07:46	06:20	2388	06:24	3092	06:25	3676	06:24	3783	06:23	3667	06:25	3918	06:23	3875	06:22	3836
16: I-20 EB (from I-75/I-85 to I-285)	9.85	16:53	13:07	10:44	09:18	3282	09:09	3737	09:00	3935	08:55	3915	08:51	4043	08:47	4386	08:45	4586	08:45	4590
16: I-20 WB (from I-285 to I-75/I-85)	9.39	16:05	12:31	10:14	08:43	5325	08:55	6822	09:15	8299	09:46	8785	10:21	9309	11:32	9600	12:33	9320	12:57	8794

Red: Travel Times with speeds below 35 mph
Orange: Travel Times with speeds between 35 mph and 45 mph
Black: Travel Times with speeds between 45 mph and 55 mph
Green: Travel Times with speeds above 55 mph

Travel Time – Reliability (Buffer Time Index)

Study Area –
The study area is the Metropolitan Atlanta freeway network covered by the Georgia NaviGAtor system. Travel times are obtained for roadway segments on the freeway network only. Arterial and local roads are not included in the computations due to the unavailability of data for those roadways. This system is split into 16 bidirectional segments for the purposes of generating this travel time reliability measure. Coverage is determined by the functioning NaviGAtor infrastructure across the Metropolitan Atlanta freeway system as depicted on Figure 1 on page B-2.

Study Period –
Buffer time and buffer time index are generated for two 4-hour periods covering the morning peak period (6:00 a.m. to 10:00 a.m.) and evening peak period (3 p.m. to 7 p.m.) for each day. An average buffer time index value is obtained for each 15-minute period during these four hours. Weekdays and weekends are separated out for the computations. Holidays are not included in the computations.

Sample Size –
The Georgia NaviGAtor cameras are strategically placed to monitor speeds and volumes, with each camera taking a measurement every 20 seconds. As many as 1.5 billion measurements are taken by these cameras each year. The measurements are examined and aggregated into 15-minute intervals for the morning and evening peak period for the weekdays only.

Deviations or exceptions -
No deviations or exceptions from the definition of this measure as provided by the study. Note that the buffer times are based on travel times obtained via processing of speed information from the video captures from the Georgia NaviGAtor video cameras.

Cost Estimates -
The cost of processing the already archived traffic speed and volume information acquired by the Georgia NaviGAtor is about $12,000 in consultant fees and 80 hours staff time annually. Only about 25 percent of this cost is directly attributable to the travel time measure. The NaviGAtor's capital and maintenance cost attributable to this data collection process is unknown and impossible to estimate. However this type of cost may be considered "sunk" cost since the NaviGAtor system is already in place, collects and archives this type of data anyway.

Utility of Performance Measure -
The buffer time index measure is included in the annual Transportation MAP Report that tracks the state of the Metropolitan Atlanta transportation system.

Travel Time Reliability (Buffer Time Index) Data Collected and Calculated Buffer Time Index
(Sample for 2006, morning peak period from 6 a.m. to 8 a.m.)

Metro Atlanta Interstate Buffer Time Index
2006
AM Peak (6:00 AM - 10:00 AM) Weekdays

Segment Description	Segment Length (miles)	Buffer Time Index (%) | VMT (Vehicles per 15 minutes)														
		6:00		6:15		6:30		6:45		7:00		7:15		7:30		7:45	
		BTI	VMT	BTI	VMT	BTI	VMT	BTI	VMT	BTI	VMT	BTI	VMT	BTI	VMT	BTI	VMT
1: I-75 NB (from I-285 to Wade Green Road)	14.00	4.01	8359	5.58	10797	8.09	13091	10.44	13945	9.65	14244	6.46	16345	3.77	17881	4.16	18306
1: I-75 SB (from Wade Green Road to I-285)	14.55	7.21	21902	25.14	25940	28.88	26080	40.25	25559	48.41	25342	47.97	25013	55.37	24693	47.39	24559
2: I-75 NB (from I-85 to I-285)	8.45	25.16	2813	26.58	3425	27.31	4001	26.49	4257	26.85	4578	26.7	5306	25.66	5825	23.89	6251
2: I-75 SB (from I-285 to I-85)	7.86	17.28	7707	22.57	8823	23.2	9435	20.91	9841	18.73	10173	23.94	11070	20.02	11762	21.25	11450
3: I-75/I-85 NB (from I-20 to I-85)	4.41	4.19	8187	5.96	9699	8.33	10237	14.13	10170	19.66	10103	19.22	10036	27.37	9957	32.63	9582
3: I-75/I-85 SB (from I-85 to I-20)	4.40	13.62	5671	13.6	6669	13.67	7372	16.81	7460	18.59	7340	23.09	7606	23.76	7653	27.93	7357
4: I-75 NB (from I-85 to I-20)	3.88	5.96	6303	5.88	8005	22.21	8963	32.76	8825	33.85	8527	33.28	8100	28.82	7568	35.45	7020
4: I-75 SB (from I-20 to I-85)	3.75	7.12	5076	8.11	6077	8.62	6595	18.14	6652	19	6610	18.98	6894	17.6	7182	18.41	7431
5: I-75 NB (from I-285 to I-85)	4.00	10.17	4560	10.26	5634	15.88	6136	13.98	6147	13.68	6536	18.81	6670	33.27	6851	21.63	6572
5: I-75 SB (from I-85 to I-285)	4.12	9.05	2048	11.26	2406	8.3	2574	9.97	2665	9.33	2622	9.84	2819	9.41	2993	9.56	3043
6: I-75 NB (from Hudson Bridge Road to I-285)	14.53	15.91	8628	18.86	10967	21.39	11618	27.15	11882	28.04	12246	33.47	13279	44.65	13528	45.1	13275
6: I-75 SB (from I-285 to Hudson Bridge Road)	14.45	3.72	4471	3.92	5937	5.32	7449	6.63	7746	7.36	7974	4.96	8835	3.53	9665	3.35	9910
7: I-85 NB (from I-285 to Old Norcross Road)	10.71	8.16	14603	6.36	17759	6.09	20162	10.07	19665	16.14	19024	26.72	20620	46.74	22183	49.85	22952
7: I-85 SB (from Old Norcross Road to I-285)	10.66	6.16	25248	19.72	29518	22.6	29769	33.6	28691	45.19	28034	41	27312	44.46	26979	49.02	26619
8: I-85 NB (from I-75 to I-285)	9.96	10.18	13232	10.42	15046	9.59	16331	8.95	16579	7.16	17497	7.94	18627	7.96	19966	7.55	20272
8: I-85 SB (from I-285 to I-75)	10.45	8.29	15766	8.44	18958	8.71	21083	11.63	21390	18.66	22106	16.55	23539	21.55	24447	27.28	24249
9: I-85 NB (from Camp Creek Parkway to I-75)	4.86	20.73	3765	39.64	4597	45.33	5269	24.52	5416	15.45	5567	14.81	5832	33.68	5808	19.67	5353
9: I-85 SB (from I-75 to Camp Creek Parkway)	4.20	16.03	2773	15.87	3200	14.22	3475	12.01	3464	6.55	3365	6.92	3456	6.02	3522	6.78	3572
10: GA-400 NB (from I-285 to Old Milton Parkway)	13.14	6.3	5433	7.1	6608	10.94	9923	10.56	14133	16.6	16103	20.84	17328	27.93	19473	32.72	19943
10: GA-400 SB (from Old Milton Parkway to I-285)	13.16	8.45	9471	10.32	13611	22.78	17983	31.04	20868	34.64	21810	58.71	21395	58.54	20432	47.94	19454
11: I-285 EB (from I-75 to GA-400)	6.82	11.91	8109	13.96	11176	25.37	13305	36.83	13830	35.44	13934	40.35	13852	42.8	13882	41.62	13613
11: I-285 WB (from GA-400 to I-75)	7.21	6.12	6264	8.02	8440	15.43	10137	13.01	10861	20.49	11612	17.57	12579	19.06	13268	19.45	13134
12: I-285 EB (from GA-400 to I-85)	6.48	16.9	5813	20.35	7725	29.46	9125	26.14	9602	24.06	9931	22.39	10618	18.91	11365	19.37	11164
12: I-285 EB (from I-85 to GA-400)	6.37	13.26	8203	15.94	11534	22.31	13484	36.77	14013	41.39	14129	35.3	14162	44.41	13968	41.26	13622
13: I-285 NB (from US-78 to I-85)	5.37	4.95	5621	10.14	7693	23.09	9598	34.64	9964	43.74	9958	53.06	10047	51.06	9798	68.47	9595
13: I-285 SB (from I-85 to US-78)	5.89	39.32	1835	20.45	2647	42.21	3396	39.54	3834	27.34	4151	19.1	4687	10.69	5017	15.61	5368
14: I-285 NB (from I-20 to US-78)	8.20	9.18	8397	11.43	11481	31.49	13809	66.5	13371	50.25	12577	58.16	12366	87.51	11541	86.78	11253
14: I-285 SB (from US-78 to I-20)	7.45	2.78	3393	2.63	4936	3.21	6511	3.75	7317	9.97	7569	12.32	8812	6.28	9766	10.96	9960
15: I-20 EB (from I-285 to I-75/I-85)	6.43	6	4618	5.26	5304	6.15	5759	6.81	5961	6.65	6281	12.25	7034	17.74	7599	30.23	7685
15: I-20 WB (from I-75/I-85 to I-285)	7.12	5.36	2388	7.12	3092	7.77	3676	8.93	3783	6.67	3667	6.05	3918	5.84	3875	4.25	3836
16: I-20 EB (from I-75/I-85 to I-285)	9.85	7.14	3282	8.52	3737	10.19	3935	11.57	3915	6.9	4043	7.57	4386	5.56	4586	5.59	4590
16: I-20 WB (from I-285 to I-75/I-85)	9.39	4.39	5325	6.28	6822	12.34	8299	18.61	8785	23.1	9309	26.79	9600	26.09	9320	23.56	8794

Purple: Buffer Time Index above 75
Red: Buffer Time Index between 50 and 75
Orange: Buffer Time Index between 25 and 50
Green: Buffer Time Index below 25

Travel Time Data Collection Worksheet

This is a worksheet for base-level travel time data used in the calculation of performance measures.

Travel time data is based on: X Speed Sensors
□ Vehicle Probe Methods
□ Other – please describe

Speed Sensors:
    Type of Speed Detectors Used - > video cameras
    Density of detectors -> approximately 1/3 of a mile apart
    Are they uniformly spaced? (if not, explain)-> approximately
    Method used to convert speed to travel time estimates -> See Appendix E "Travel Time
Computation Methodology" on page E-1.
    Maintenance and quality control procedures -> Current NaviGAtor system procedures

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Vehicle Probes: NONE
    Probe technology (i.e. floating vehicle, toll tags, GPS AVL, etc.) ->
    Sample size and anticipated level of accuracy ->
    Validation procedures (if travel time data is contracted) ->

Other: NONE
    Description of technology ->
    Method to determine and validate accuracy ->

For all methods:

Provide estimate of the cost of data collection:
        Equipment: N/A
        Staff time: N/A
        Consultant support: N/A
        Contracted services: N/A
        Overall estimate: N/A
The data is currently collected and archived by the Georgia NaviGAtor system but does not support other performance measurement applications.

Travel Time Computation Methodology

1. Sixteen bidirectional corridors (yielding 32 segments) are identified in the Metro Atlanta roadway network covered by the Georgia NaviGAtor system. Average travel times are computed for each of these segments.
2. Travel times are computed for roadway segments on the freeway network only. Arterial and local roads are not included in the computations due to the unavailability of data for those roadways.
3. Travel times are generated for two 4-hour periods covering the AM and PM peak periods for each day. An average travel time value is obtained for each 15-minute period during these four hours. Weekdays and weekends are separated out for the computations. Holidays are not included in the computations. Monthly and annual averages are computed for the travel times for each segment.
4. The computations are performed with archived NaviGAtor data that is aggregated at 15-minute intervals. This data consists of volume (number of vehicles) and average speed (miles per hour).
5. The speed data is averaged over all lanes (including HOV) for a given station to obtain a single value (speed and volume) for each station. These stations are typically 1/3 of a mile apart. Each of the 32 segments has several stations within them. Each of these segments is divided into several sub-sections with at least 5 stations in every sub-section.
6. The average speed at a station is computed by performing a weighted average of the individual lane average speeds with individual lane volumes as weights.

$$S = \frac{\sum_i S_i V_i}{\sum_i V_i}$$

   Where
   S   : Average station speed (mph)
   S_i : Average lane speed (mph)
   V_i : Station volume (vehicles)
7. An average speed value for a sub-section is computed as the average of the speeds at the stations within the sub-section. This averaging process excludes missing values and obtains a mean based exclusively on the available station speeds. The travel time for a sub-section is computed as:

   Travel time $_{Sub\text{-}section}$ = Length $_{Sub\text{-}section}$ / Speed $_{Sub\text{-}section}$

8. The travel-time for a segment is computed as the sum of the travel-times of the subsections:

$$Travel\ time_{Segment} = \sum Travel\ time_{Sub-sec\,tions}$$