

Appendix B
Level of Service Definitions
Used for East Link Analysis

TABLE B-1
LOS Definitions for Service Frequency (Urban Schedule Transit Service)

LOS	Headway (min.)	Comments
A	<10	Passengers don not need schedules
B	10-14	Frequent service, passengers consult schedules
C	15-20	Maximum desirable time to wait if bus/train missed
D	21-30	Service unattractive to choice riders
E	31-60	Transit service is available
F	>60	Service unattractive to all riders

Source: Transit Capacity and Quality Service Manual, Transportation Research Board (TRB), 2003.

TABLE B-2
LOS Definitions for Hours of Service

LOS	Hours of Service	Comments
A	19-24	Night or owl service provided
B	17-18	Late evening service provided
C	14-16	Early evening service provided
D	12-13	Daytime service provided
E	4-11	Peak hour service/limited midday service
F	0-3	Very limited or no service

Source: Transit Capacity and Quality Service Manual, TRB, 2003.

TABLE B-3
LOS Definition for Bus Passenger Load

LOS	passenger/seat	Comments
A	0.00-0.50	No passengers need sit next to another
B	0.51-0.75	Passengers can choose where to sit
C	0.76-1.00	All passengers can sit
D	1.01-1.25	Comfortable standee load for design
E	1.26-1.50	Maximum schedule load
F	>1.5	Crush load

Source: Transit Capacity and Quality Service Manual, TRB, 2003.

TABLE B-4
LOS Definition for Rail Passenger Load

LOS	ft ² /passenger	Comments
A	>10.8 ^a	At most some passengers must stand
B	8.2-10.8	No Passengers need to stand next to another
C	5.5-8.1	Passengers can choose where to stand
D	3.9-5.4	Comfortable standee load for design
E	2.2-3.8	Maximum schedule load
F	<2.2	Crush load

^a This includes the potential for some cars to not have any standing passengers.

Source: Adapted from Transit Capacity and Quality Service Manual, TRB, 2003.

TABLE B-5
LOS Definitions for Reliability (On-Time Performance)

LOS	On-Time Percentage ^a	Description
A	95.0% - 100%	1 late transit vehicle every 2 weeks (no transfer)
B	90.0% - 94.9%	1 late transit vehicle every week (no transfer)
C	85.0% - 89.9%	3 late transit vehicles every 2 weeks (no transfer)
D	80.0% - 84.9%	2 late transit vehicles every week (no transfer)
E	75.0% - 79.9%	1 late transit vehicle every day (with a transfer)
F	<75.0%	1 late transit vehicle at least daily (with a transfer)

^a "On time" is 0 to 5 minutes late; early departures are not considered on time.

Source: Transit Capacity and Quality Service Manual, TRB, 2003.

TABLE B-6
LOS Definitions for Reliability (Headway Adherence)

LOS	Coefficient of Variation	Description
A	0.00-0.21	Service provided like clockwork
B	0.22-0.30	Vehicles slightly off headway
C	0.31-0.39	Vehicles often off headway
D	0.40-0.52	Irregular headways, with some bunching
E	0.53-0.74	Frequent bunching
F	>0.75	Most vehicles bunched

^a Coefficient of variation is the deviation in actual departing headways over the scheduled headway. A high coefficient of variation signifies a large difference between the actual and scheduled departure time, resulting in a poor reliability LOS.

Note: Headway Adherence LOS applies only to transit routes with headways of 10 minutes or less.

Source: Transit Capacity and Quality Service Manual, TRB, 2003.

TABLE B-7
LOS Definitions for Intersections

Level of Service	Average Delay (seconds per vehicle)	Traffic Flow Characteristics
Signalized Intersections		
A	< 10	Most vehicles arrive during the green phase and do not stop at all.
B	> 10 - < 20	More vehicles stop, causing higher delay.
C	> 20 - < 35	Vehicles stopping is significant, but many still pass through the intersection without stopping.
D	> 35 - < 55	Many vehicles stop, and the influence of congestion becomes more noticeable.
E	> 55 - < 80	Very few vehicles pass through without stopping.
F	> 80	Considered unacceptable to most drivers. Intersection is not necessarily over capacity, even though arrivals exceed capacity of lane groups.
Unsignalized Intersections		
A	≤ 10	Little or no traffic delays
B	> 10 - ≤ 15	Short traffic delays
C	> 15 - ≤ 25	Average traffic delays
D	> 25 - ≤ 35	Long traffic delays
E	> 35 - ≤ 50	Very long traffic delays
F	> 50	Queuing on minor approaches and not enough gaps of suitable size to allow safe crossing of major streets. Signalization should be investigated at this point, but warrants must be satisfied before implementation.

Source: Highway Capacity Manual, TRB, 2000.

TABLE B-8
LOS Definitions for Freeways

Level of Service	Density (passenger car/mile/lane)	Traffic Flow Characteristics
Basic Freeway Segment		
A	≤ 11	Free flows operation, vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.
B	$> 11 - \leq 18$	Reasonably free flow, vehicles maneuver within the traffic stream is only slightly restricted.
C	$> 18 - \leq 26$	Freedom to maneuver within the traffic stream is noticeably restricted.
D	$> 26 - \leq 35$	Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort level.
E	$> 35 - \leq 45$	Vehicles are closely spaced, leaving little room to maneuver within the traffic stream at speed that still exceed 49 mph.
F	> 45	Breakdowns in vehicular flow.
Merging and Diverging Area		
A	≤ 10	Unrestricted operation, smooth merging and diverging.
B	$> 10 - \leq 20$	Merging and diverging maneuvers become noticeable to through drivers.
C	$> 20 - \leq 28$	Both ramp and freeway vehicles begin to adjust their speeds to accomplish smooth transitions.
D	$> 28 - \leq 35$	Virtually all vehicles slow to accommodate merging and diverging.
E	> 35	Flow levels approach capacity, and small changes in demand or disruptions within the traffic stream can cause both ramp and freeway queues to form.
F	Demand exceeds capacity	
Weaving Area		
A	≤ 10	Unrestricted operation, smooth weaving movements.
B	$> 10 - \leq 20$	Weaving maneuvers become noticeable to through drivers.
C	$> 20 - \leq 28$	Both ramp and freeway vehicles begin to adjust their speeds to accomplish smooth transitions.
D	$> 28 - \leq 35$	Virtually all vehicles slow to accommodate weaving movements.
E	$> 35 - \leq 43$	Flow levels approach capacity, and small changes in demand or disruptions within the traffic stream can cause both ramp and freeway queues to form.
F	> 43	

Source: Highway Capacity Manual, TRB, 2000.

TABLE B-9
LOS Definitions for Platoon-Adjusted Criteria for Walkways and Sidewalks

LOS	Flow Rate (p/min/ft)	Description
A	< 0.5	Walking speeds freely selected; conflicts with other pedestrians unlikely.
B	> 0.5-3	Walking speeds freely selected; pedestrians respond to presence of others.
C	> 3-6	Walking speeds freely selected; passing is possible in unidirectional streams; minor conflicts for reverse or cross movement.
D	> 6-11	Freedom to select walking speed and pass others is restricted; high probability of conflicts for reverse or cross movements.
E	> 11-18	Walking speeds and passing ability are restricted for all pedestrians; forward movement is possible only by shuffling; reverse or cross movements are possible only with extreme difficulty; volumes approach limit of walking capacity.
F	> 18	Walking speeds are severely restricted; frequent, unavoidable contact with others; reverse or cross movements are virtually impossible; flow is sporadic and unstable.

Note: Flow rates in the table represent average flow rates over a 5-6 minute period.

Source: Highway Capacity Manual, TRB, 2000.

