

APPENDIX J

LEVELS OF SERVICE DEFINITIONS

Freeways - Level of Service (LOS) is a qualitative measure of traffic flow. For freeways, LOS represents the freedom with which a driver can maneuver within the traffic stream. This freedom to maneuver is a function of the traffic density.

Freeway LOS is divided into six levels designated by the letters "A" through "F". A brief description of each freeway service level is given below. Pictures of freeway LOS and further discussion on this subject is found in the "Highway Capacity Manual" beginning on page 13-8.

LOS "A" – Free-flow operations at free flow speeds. Vehicles can maneuver within the traffic stream unimpeded. Traffic incidents have no noticeable impact to traffic operating at LOS "A".

LOS "B" – Reasonable free-flow operation at free flow speeds. The ability to maneuver within the traffic stream is only slightly restricted and driver comfort is still high. Traffic incidents have no noticeable impact to traffic operating at LOS "B".

LOS "C" – Traffic flows with speed at or near free flow speed. The ability to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance of the driver. Minor traffic incidents can still be absorbed but the impact to service will be substantial resulting in queues behind any significant blockage.

LOS "D" – Speeds drop noticeably as traffic density approaches unstable flow conditions. The ability to maneuver within the traffic stream is more noticeably restricted, and the driver experiences reduced physical and psychological levels of comfort. A minor incident at this level of service will create queuing as there is little space in the traffic stream to absorb any disruptions.

LOS "E" – Also known as capacity flow or forced flow. Operations at this level are very unstable and there are virtually no gaps in the traffic stream. Any disruption of the traffic stream, even entering traffic or lane changes, can create a disruption to traffic flow. Any incident will lead to substantial disruption to the traffic flow and extensive queuing. Maneuvering within the traffic stream is extremely limited and the physical and psychological comfort afforded the driver is poor.

LOS "F" – This level describes a breakdown in traffic flow, also known as a traffic jam.

Arterials – For urban streets, LOS describes the through-vehicle travel speed of a segment or for an entire street. Arterial LOS is an entirely different performance measure than freeway LOS even though both use the letters "A" through "F" to designate the different service levels. The average travel speed is computed from the running speed including the control delay (stop signs and traffic lights) at intersections. Thus the more intersections there are and the type of control used at the intersections will affect arterial LOS. Inappropriate signal timing or lack of signal coordination or progression can significantly degrade arterial LOS.

Arterial streets are divided into four speed classes based on free flow speed or speed ranges. Exhibit 15-2 from the Highway Capacity Manual identifies the speed ranges by street class for each level of service "A" through "F". A copy of Exhibit 15-2 is provided below. Further discussion on arterial LOS can be found in the "Highway Capacity Manual" beginning on page 15-2.



TABLE J -1

FREE FLOW SPEED METHODOLOGY FOR MODEL V4.x

FT, FUNCTIONAL TYPE	AT, AREA TYPE	FREE-FLOW SPEED (SFF)	BASE SPEED (NCHRP 387)	SIGNAL / STOP DENSITY (ESTIMATED)	UNCONGESTED DELAY PER STOP (LOS B-C)
1 Centroid / Local	5 CBD	13.4	22	7.0	15.0
1 Centroid / Local	4 Urban	16.2	25	6.0	13.0
1 Centroid / Local	3 Suburban	21.2	30	5.0	10.0
1 Centroid / Local	1-2 Rur / Transition	23.2	30	3.5	10.0
2 Principle Arterial	5 CBD	28.2	42	2.8	15.0
2 Principle Arterial	4 Urban	32.8	45	2.3	13.0
2 Principle Arterial	3 Suburban	39.6	50	1.9	10.0
2 Principle Arterial	1-2 Rur / Transition	43.7	55	1.7	10.0
3 Minor Arterial	5 CBD	27.5	42	3.0	15.0
3 Minor Arterial	4 Urban	30.6	45	2.9	13.0
3 Minor Arterial	3 Suburban	36.4	50	2.7	10.0
3 Minor Arterial	1-2 Rur / Transition	42.1	55	2.0	10.0
4,5,6 Collectors	5 CBD	22.9	37	4.0	15.0
4,5,6 Collectors	4 Urban	27.1	40	3.3	13.0
4,5,6 Collectors	3 Suburban	32.4	45	3.1	10.0
4,5,6 Collectors	1-2 Rur / Transition	32.7	45	3.0	10.0
31 Fwy: lower capacity	N/A	67.0	67		
32 Fwy: higher capacity	N/A	67.0	67		
33 Fwy: CD roads	N/A	55.0	55		
34 Fwy: HOV lanes	N/A	67.0	67		
35 Fwy: Rural / High spd	N/A	75.0	75		
36 Fwy: On / Off ramp	N/A	22.9	25	1	13.0
37 Fwy: loop ramp		30.0	30		
9 Non-Fwy Urban interchange, cross-street		38.0	38	0	
10 Non-Fwy Urban interchange, major street		50.0	50	0	
11-12 Multilane Hwy (P,M)	N/A	50.0	60	0.8	15.0
21-23 Rural Hwy (P,M,C)	N/A	51.4	60	1	10.0

* FT is a numeric code for functional type (class)

* Speeds assume more than 1 lane per direction. If just one lane, speeds are lowered by 1 mph to account for inability to pass.

* $SFF = 1 / ((1 / \text{unsignalized speed}) + (\text{Num stops per mile} * \text{Uncongested delay per V} / 3600))$

TABLE J-2

**ARTERIAL STREET FUNCTIONAL CLASSIFICATION GUIDELINES
WFRC TRAVEL MODEL**

REQUIRED STOPS / MILE DUE TO SIGNALS OR STOP SIGNS				
	CBD	Urban	Suburban	Transition
P.Art	2.8	2.3	1.9	1.7
M.Art	3.0	2.9	2.7	2.0
Coll	4.0	3.3	3.1	3.0
Local	7.0	6.0	5.0	3.5
UNSIGNALIZED SPEED				
	CBD	Urban	Suburban	Transition
P.Art	42.0	45.0	50.0	55.0
M.Art	42.0	45.0	50.0	55.0
Coll	37.0	40.0	45.0	45.0
Local	22.0	25.0	30.0	30.0
UNCONGESTED DELAY PER STOP – ALL TYPES (SEC / VEHICLE BETWEEN LOS B – C)				
	CBD	Urban	Suburban	Transition
All types	15.0	13.0	10.0	10.0



