**Q1: Simulation in VISSIM**

1. Network information

Please see the figures below for network information.

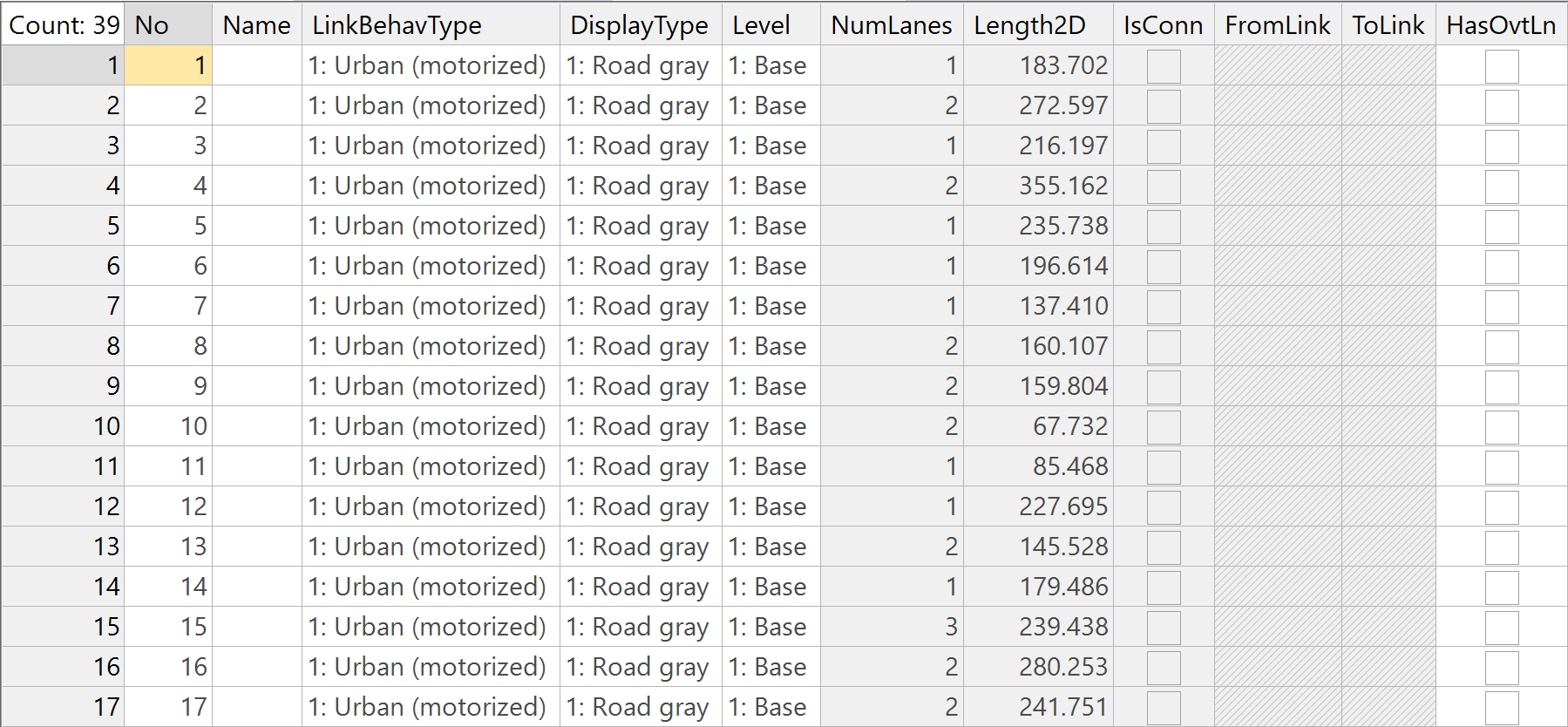


Figure 1 Link list

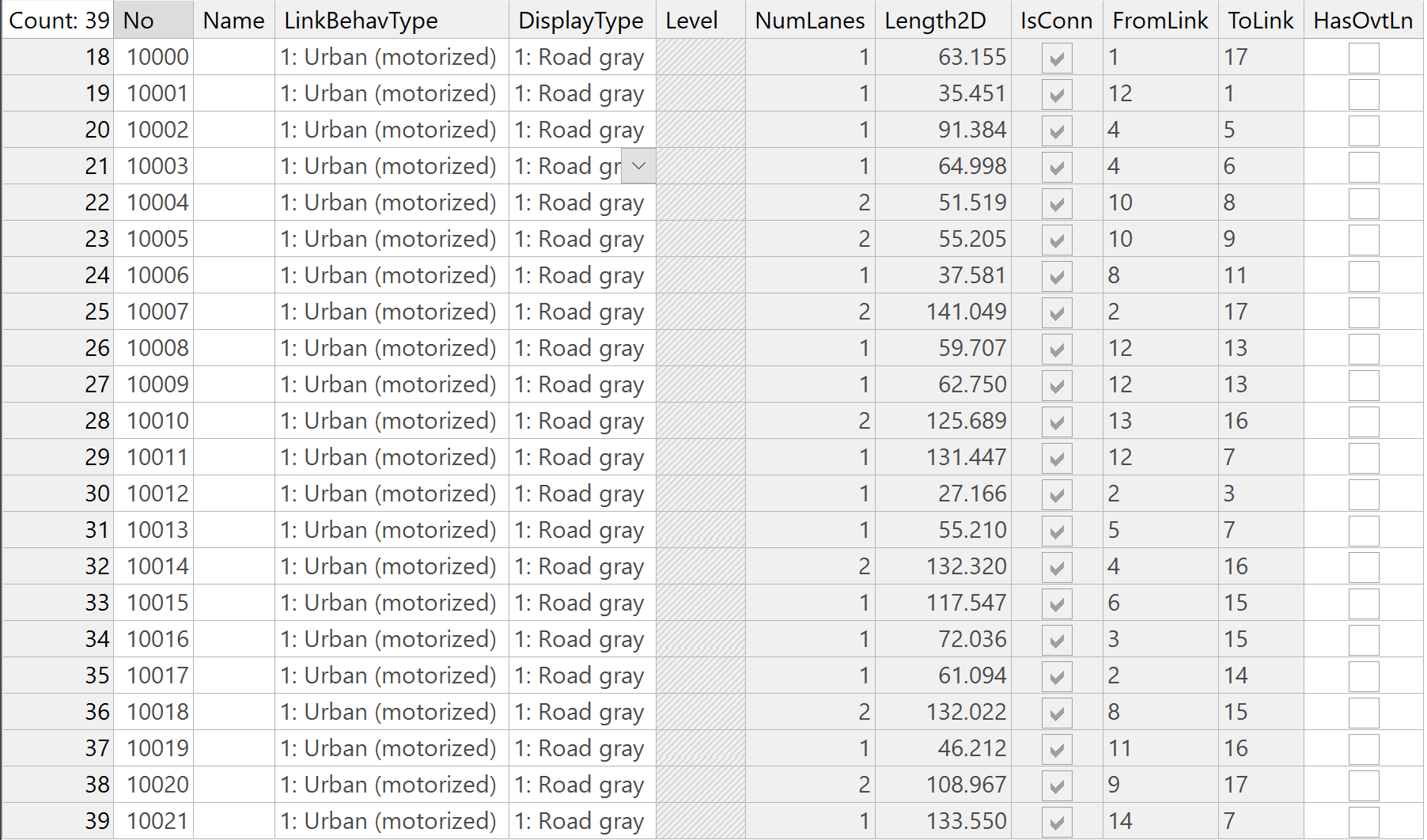


Figure 2 Connector list

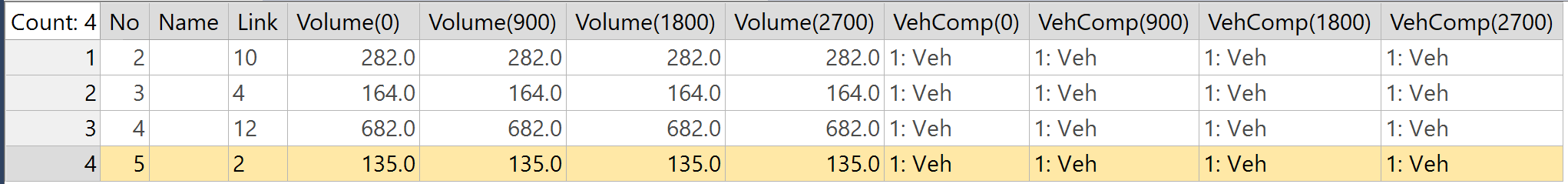


Figure 3 Vehicle inputs list

1. Travel time Evaluation

Please see the figure below for simulation results

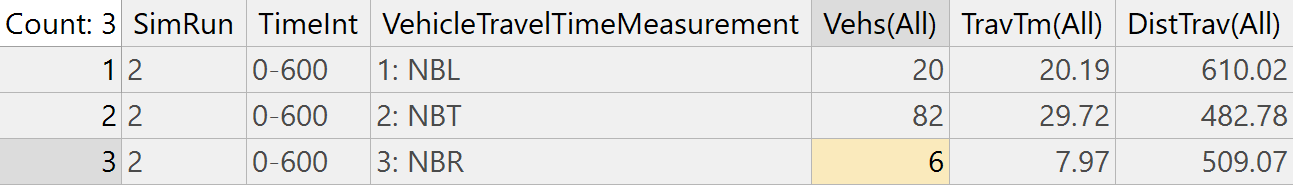


Figure 4 Vehicle travel time results

**Q2: Deriving Greenberg’s macroscopic model from GM-3 car-following model**

GM-3 car-following model:

(1)

Integrating on both side

(2)

denotes the space between two vehicles, which can also be represented as , then we have

(3)

Let be substituted for constant , then

(4)

Since when , :

(5)

can by obtained by solving the equation (5) above. Finally, equation (5) can be written as

(6)

**Q3: Deriving Q=KV from Little’s law**

Little’s law:

(1)

To derive the relationship between three basic parameters, treat and as number of vehicles on the roads and average travel time respectively. Assuming the length of the road is , then we have

(2)

using equation Little’s law.

Further,

(3)

For the left side of equation (3), , where denotes the density. For the right side, , where denotes the arrival rate. Meanwhile, , where means the average speed of all vehicles. So, we can obtain , then .