Simulation Outline - Baseline (No Traffic Lights):

- All simulations are calculated on an hourly basis.

Speed:

- Main road: 65km/h
- Local road 50km/h (Assumed)

Case 1: Rush Period Main & Local Road

Inter-arrival time is split into 4 directions:

- North: 3600 / 200 = 18
- South: 3600 / 300 = 12
- West: 3600 / 200 = 18
- East: 3600 / 200 = 18

All cars follow an exponential distribution.
Running time: 15 minutes – 900 seconds.

Case 2: Reversed Rush Period – Main Road:

Inter-arrival time is split into 4 directions:

- North: 3600 / 300 = 12
- South: 3600 / 200 = 18
- West: 3600 / 10 = 360
- East: 3600 / 10 = 360

All cars follow an exponential distribution.
Running time: 60 minutes – 3600 seconds.

Case 3: Daytime Traffic – Main & Local Road

Inter-arrival time is split into 4 directions:

- North: 3600 / 100 = 36
- South: 3600 / 100 = 36
- West: 3600 / 10 = 360
- East: 3600 / 10 = 360
- Reduce IAT to two variables, one for main and local road.

All cars follow an exponential distribution.
Running time: 60 minutes – 3600 seconds.

Simulation Outline - Traffic Light Simulation:

Assumptions:

Speed:

- Main road: 100km/h
- Local road: 80km/h

Density:

- Main road northbound: 600v/h (S1), 200v/h (S2), 375v/h (S3)
- Main road southbound: 400v/h (S1), 150v/h (S2), 225v/h (S3)
- Local road westbound: 400v/h (S1), 300v/h (S2), 175v/h (S3)
- Local road eastbound: 275v/h (S1), 175v/h (S2), 75v/h (S3)

A total of 3 simulations will be built testing out different traffic light settings and different volumes of traffic.

Setting 1: Traffic Light setting 1

Inter-arrival time split into two roads:

- North: 3600 / 300 = 18
- South: 3600 / 300 = 18
- West: 3600 / 200 = 12
- East: 3600 / 200 = 12

Running time is 15 minutes or 900 seconds. Simulation models will be evaluated based on an hour.

Traffic light: NS [Green – 25, Yellow – 5, Red - 25] | EW [Green – 20, Yellow – 5, Red – 30]

Setting 2: Traffic Light setting 2

Inter-arrival time split into two roads:

- North: 3600 / 225 = 16
- South: 3600 / 150 = 24
- West: 3600 / 300 = 12
- East: 3600 / 175 = 21

Running time is 10 minutes or 600 seconds. Simulation models will be evaluated based on an hour.

Traffic light: NS [Green – 15, Yellow – 5, Red - 20] | EW [Green – 15, Yellow – 5, Red – 20]

Setting 3: Traffic Light setting 3

Inter-arrival time split into two roads:

- North: 3600 / 360 = 10
- South: 3600 / 150 = 24
- West: 3600 / 300 = 12
- East: 3600 / 75 = 48

Running time is 20 minutes or 1200 seconds. Simulation models will be evaluated based on an hour.

Traffic light: NS [Green – 30, Yellow – 5, Red - 30] | EW [Green – 25, Yellow – 5, Red – 35]

Overall Modifications:

The provided code was modified in the following ways:

- The IAT time was split to reflect each direction – North, South, West and East.
- The emergency braking and coasting was re-calculated to adapt to the provided and assumed speeds.
- A histogram at the end of the code was introduced to plot the Distribution of Mean Waiting Time.
- Lastly the parameters were changed to align with the project brief and general assumption for both simulation states.