Impact of Crowd Density on Urban Traffic Metrics

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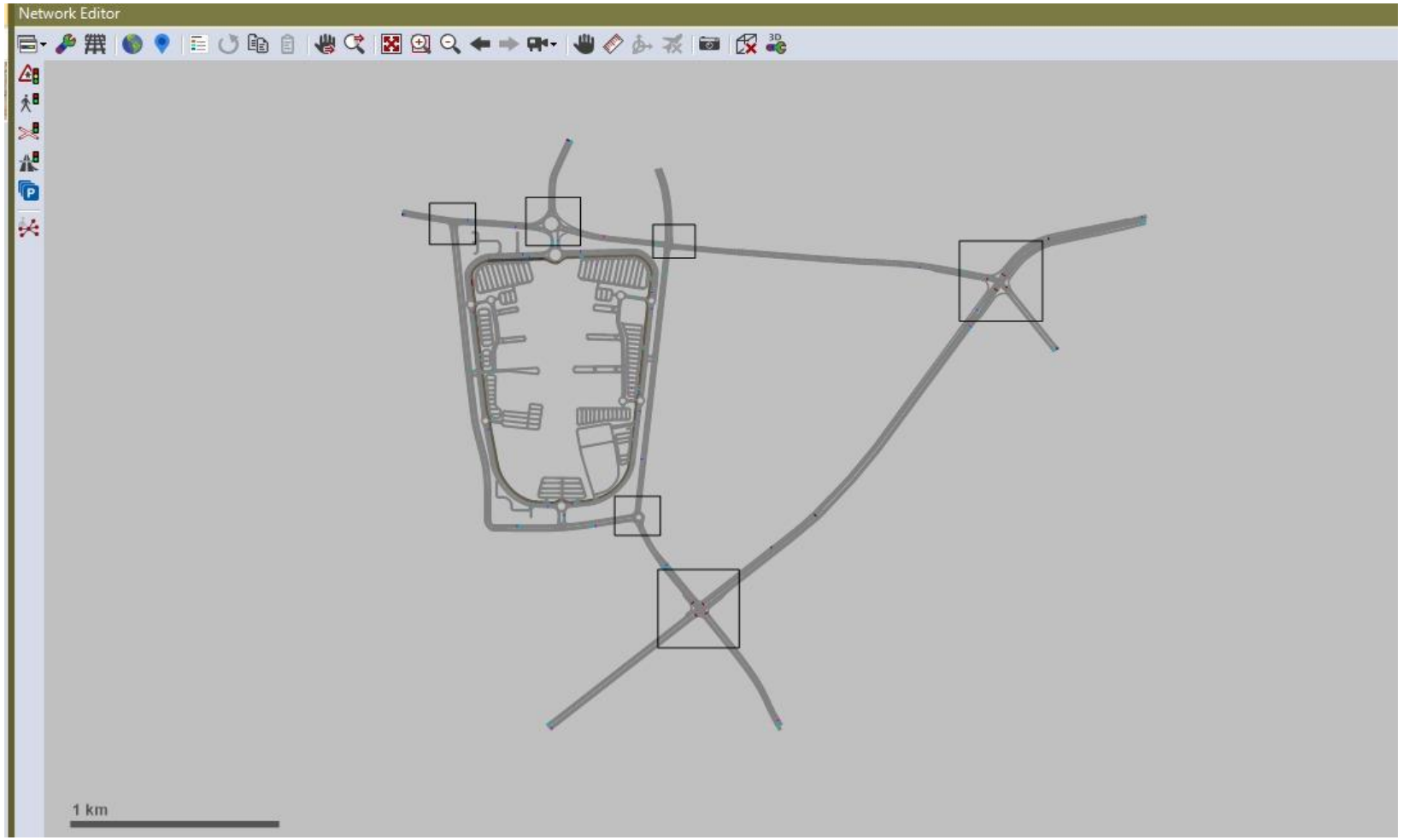
Introduction

- This project analyzes the traffic flow and road network surrounding PSAU Using VISSIM.
- Key Objectives:
- - Simulating traffic conditions using Vissim .
- - Extracting data on both scenarios (Crowded – Not Crowded) for metrics like queue lengths, vehicle delays, and emissions.
- - Using insights for traffic optimization and sustainable planning.

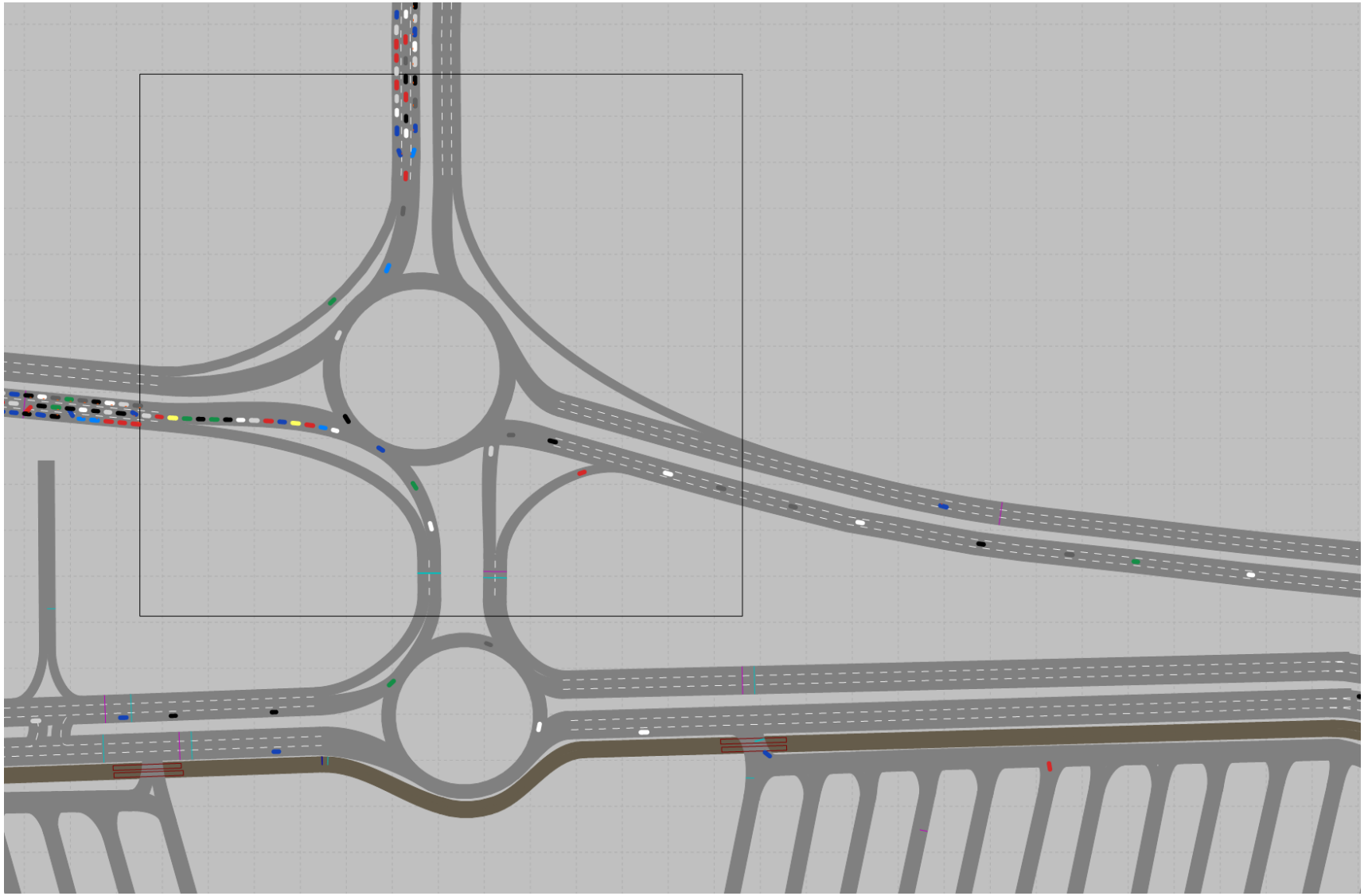
Key Traffic Attributes

- **QLen**: Queue length.
- **QLenMax**: Maximum queue length.
- **Vehs(All)**: Total number of vehicles.
- **LOS**: Level of Service, graded from A to F:
  - **A**: Free-flow traffic, no delays. Ideal conditions.
  - **F**: Traffic flow breakdown; long delays.
- **Vehicle delay (average) (All)**: Average delay of all vehicles.
- **StopDelay(All)**: Stopped delay, measured in seconds.
- **Stops(All)**: Number of vehicle stops per vehicle.
- **EmissionsCO**: Carbon monoxide emissions [grams].
- **EmissionsNOx**: Nitrogen oxides quantity [grams].
- **EmissionsVOC**: Volatile organic compounds emissions.
- **FuelConsumption**: Fuel consumption [in gallons].

Network Design



Network Design



Network Diagram References

Crowded Scenario Output Results:

Simulation Time: 8:00 am – 9:00 am

MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	LOS(ALL)	VEHDELAY(ALL)	STOPDELAY(ALL)	STOPS(ALL)	EMISSIONSCO	EMISSIONSNOX	EMISSIONSVOC	FUELCONSUMPTION
Najran Street	0	24.29	145	LOS A	0.1	0	0	87.303	16.986	20.233	1.249
King Khaled Street	0	0	238	LOS A	0.07	0	0	166.957	32.484	38.694	2.389
Abdullah Bin Amer	0	0	282	LOS A	0.05	0	0	146.687	28.54	33.996	2.099
Municipality intersection	0.83	23.86	486	LOS B	17.76	15.16	0.35	703.695	136.914	163.088	10.067
Boulevard Street	0	6.03	138	LOS A	0.54	0	0	86.625	16.854	20.076	1.239
King Abdullah intersection	1.37	23.59	556	LOS B	19.47	16	0.56	859.441	167.216	199.184	12.295

Total of : 1845 Cars

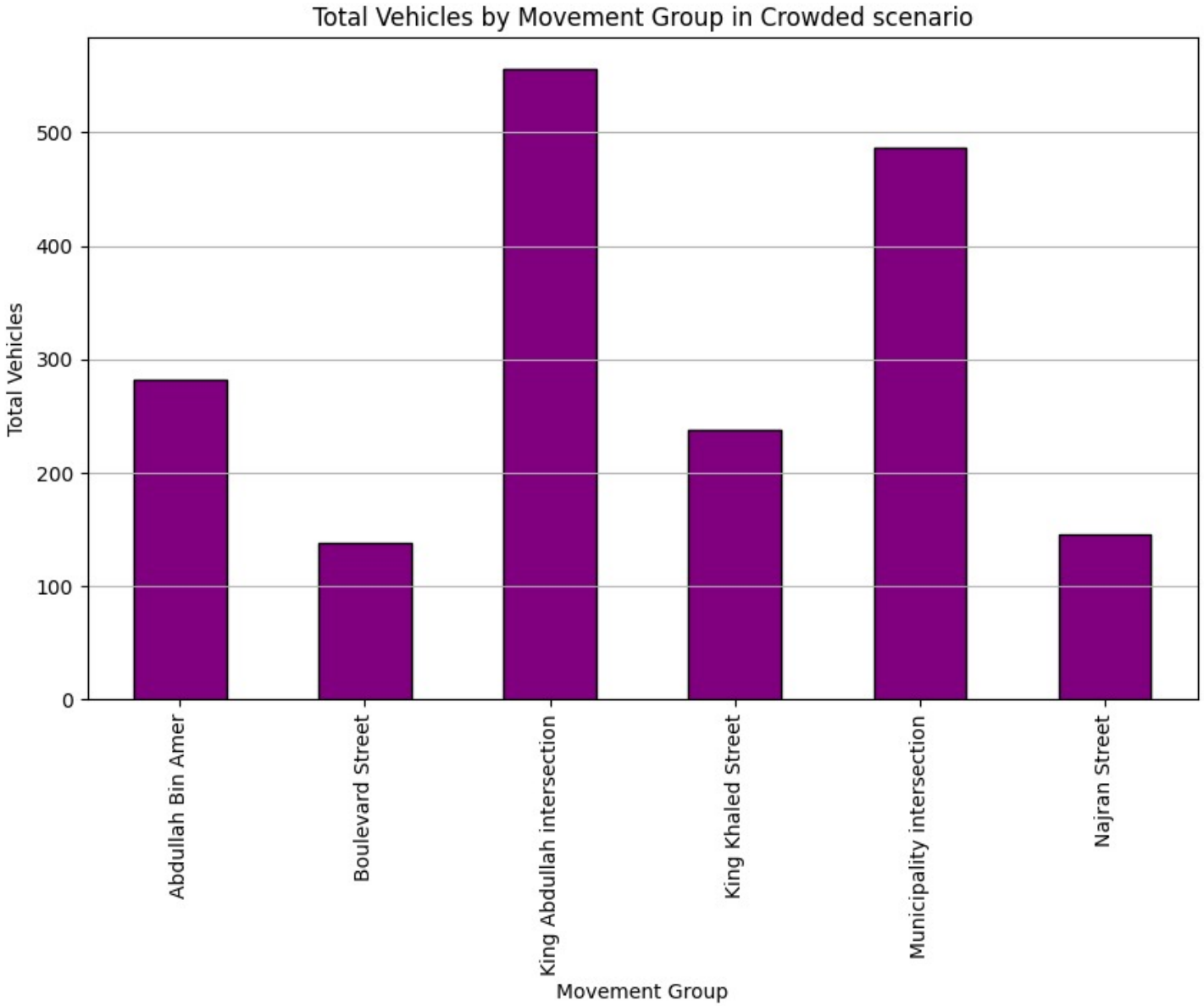
UnCrowded Scenario Output Results:

Simulation Time: 8:00 am – 9:00 am

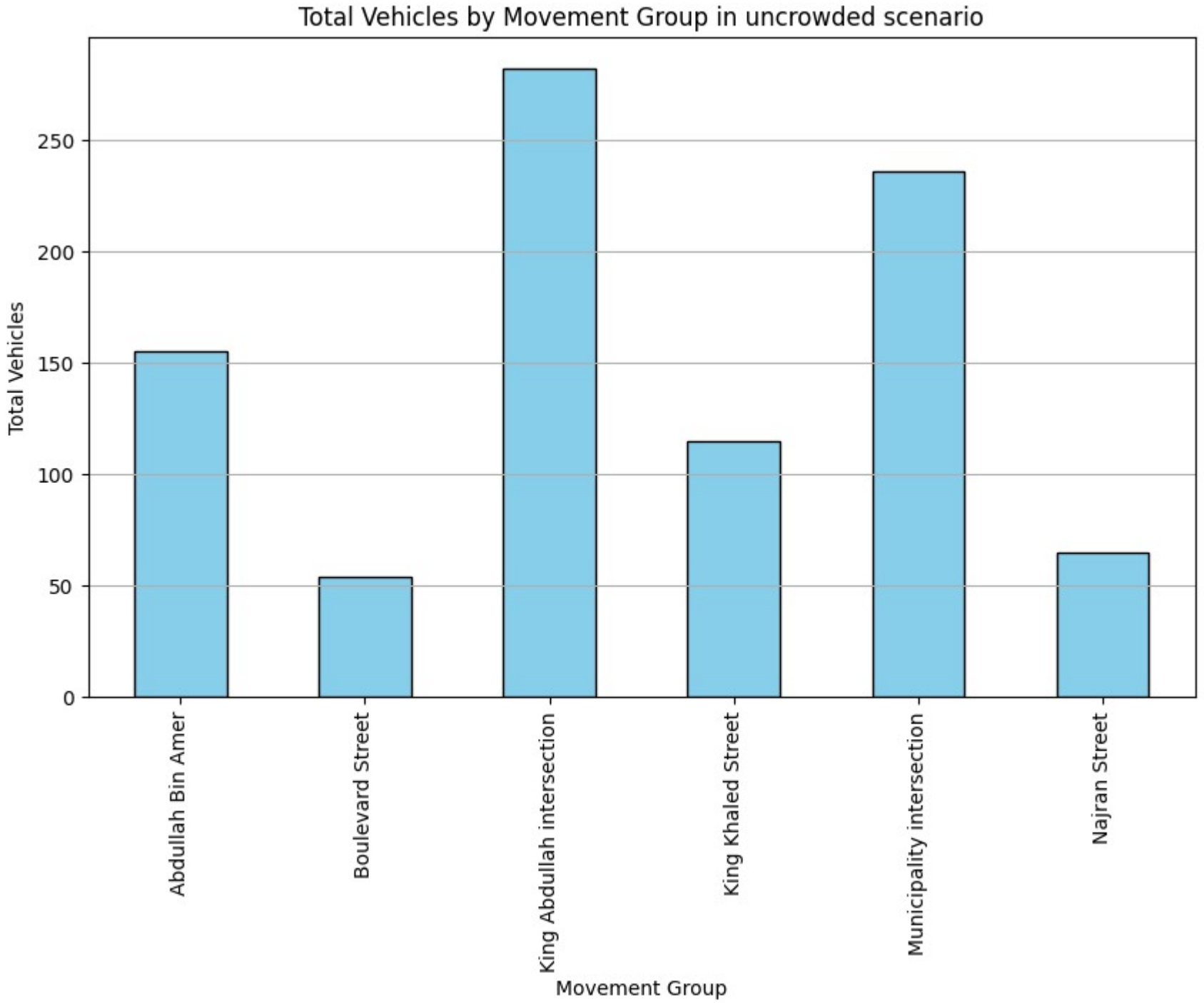
MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	LOS(ALL)	VEHDELAY(ALL)	STOPDELAY(ALL)	STOPS(ALL)	EMISSIONSCO	EMISSIONSNOX	EMISSIONSVOC	FUELCONSUMPTION
Najran Street	0	0	65	LOS_A	0.03	0	0	39.097	7.607	9.061	0.559
King Khaled Street	0	0	115	LOS_A	0	0	0	82.471	16.046	19.114	1.18
Abdullah Bin Amer	0	0	155	LOS_A	0.02	0	0	80.661	15.694	18.694	1.154
Municipality intersection	0.48	17.39	236	LOS_B	18.16	15.71	0.34	341.099	66.365	79.053	4.88
Boulevard Street	0	0	54	LOS_A	0.15	0	0	33.297	6.478	7.717	0.476
King Abdullah intersection	0.72	24.18	282	LOS_B	18.85	15.72	0.42	421.608	82.03	97.712	6.032

Total of 907 Cars

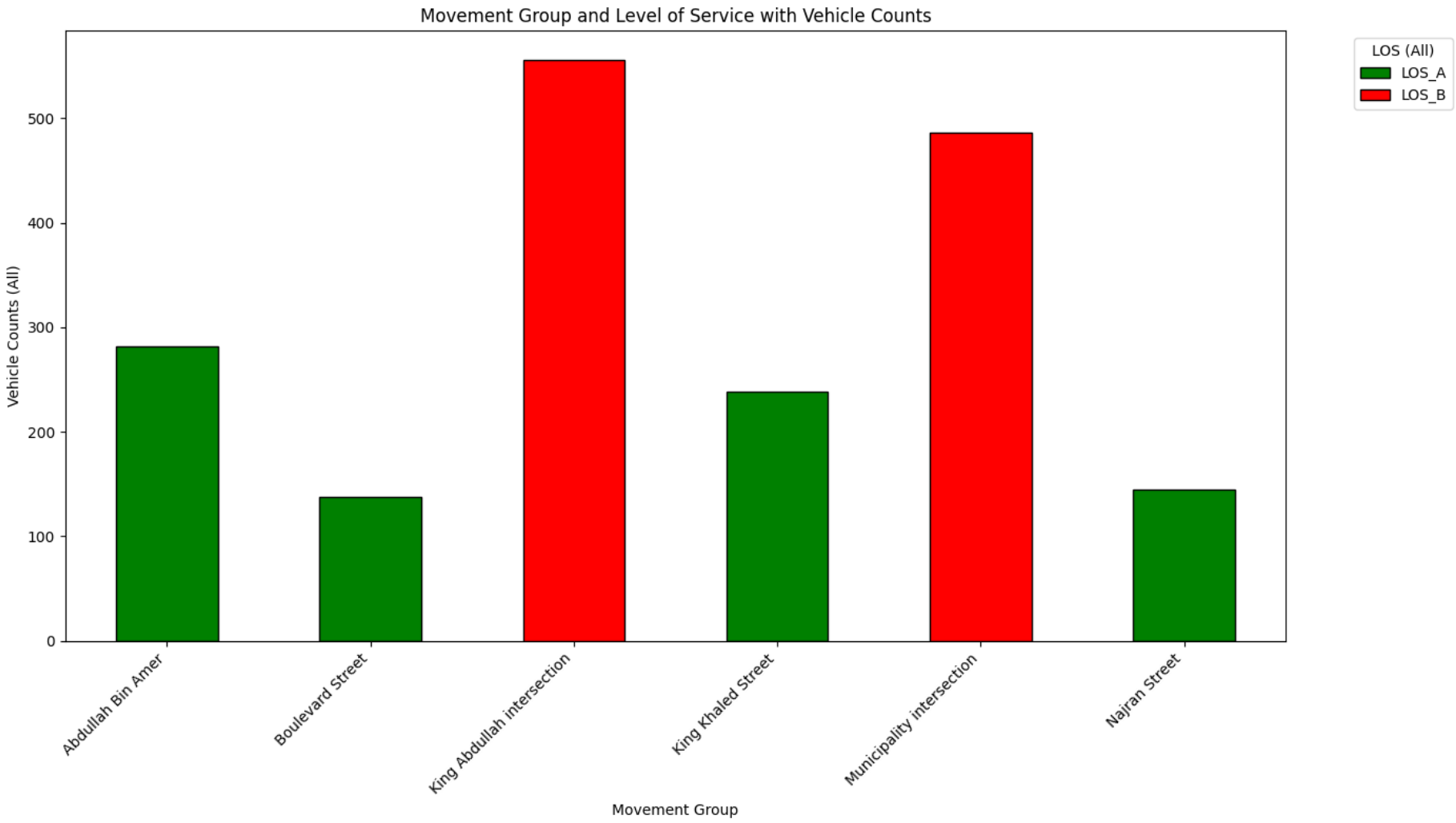
Total Vehicles In Crowded



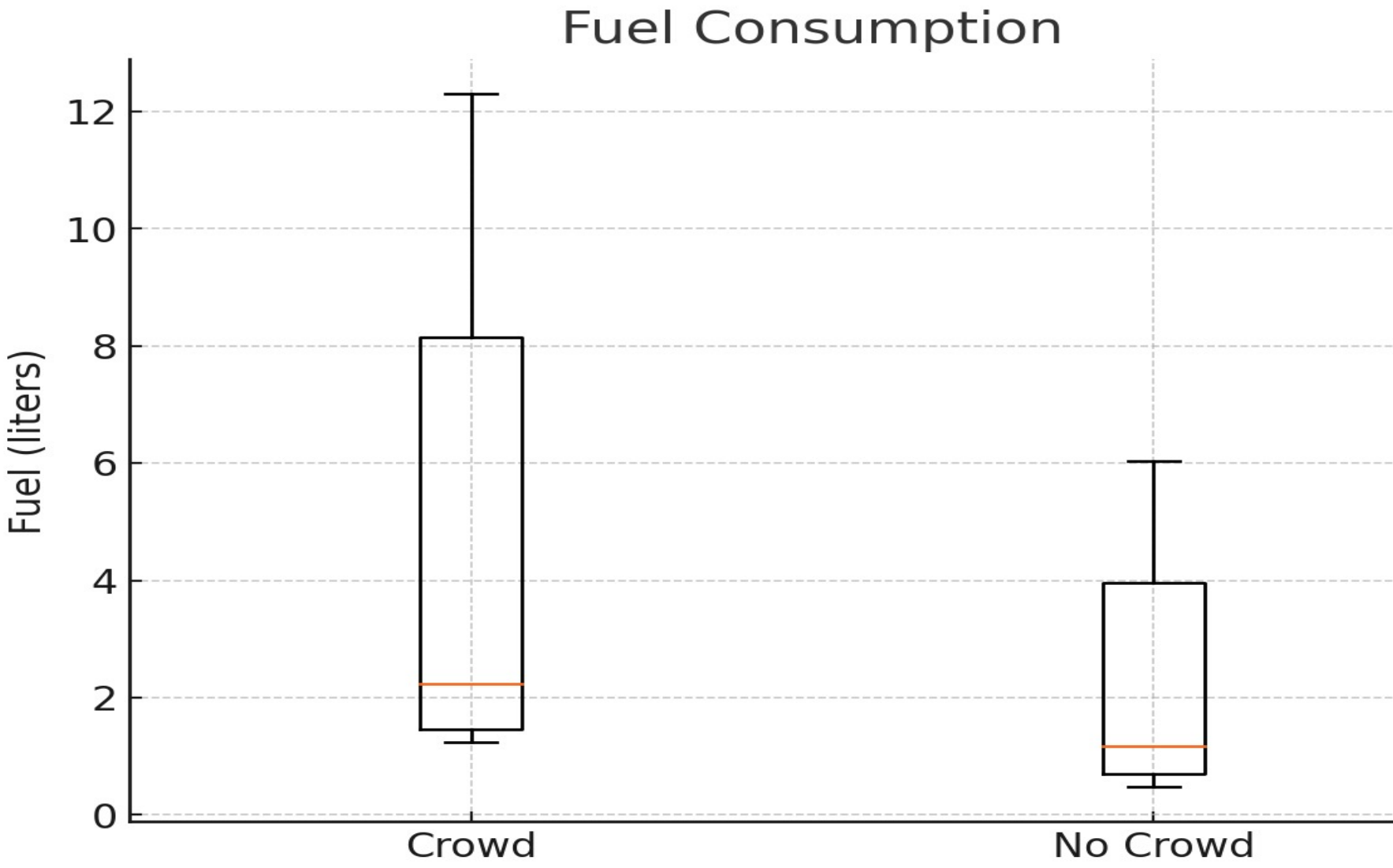
Total Vehicles In Uncrowded



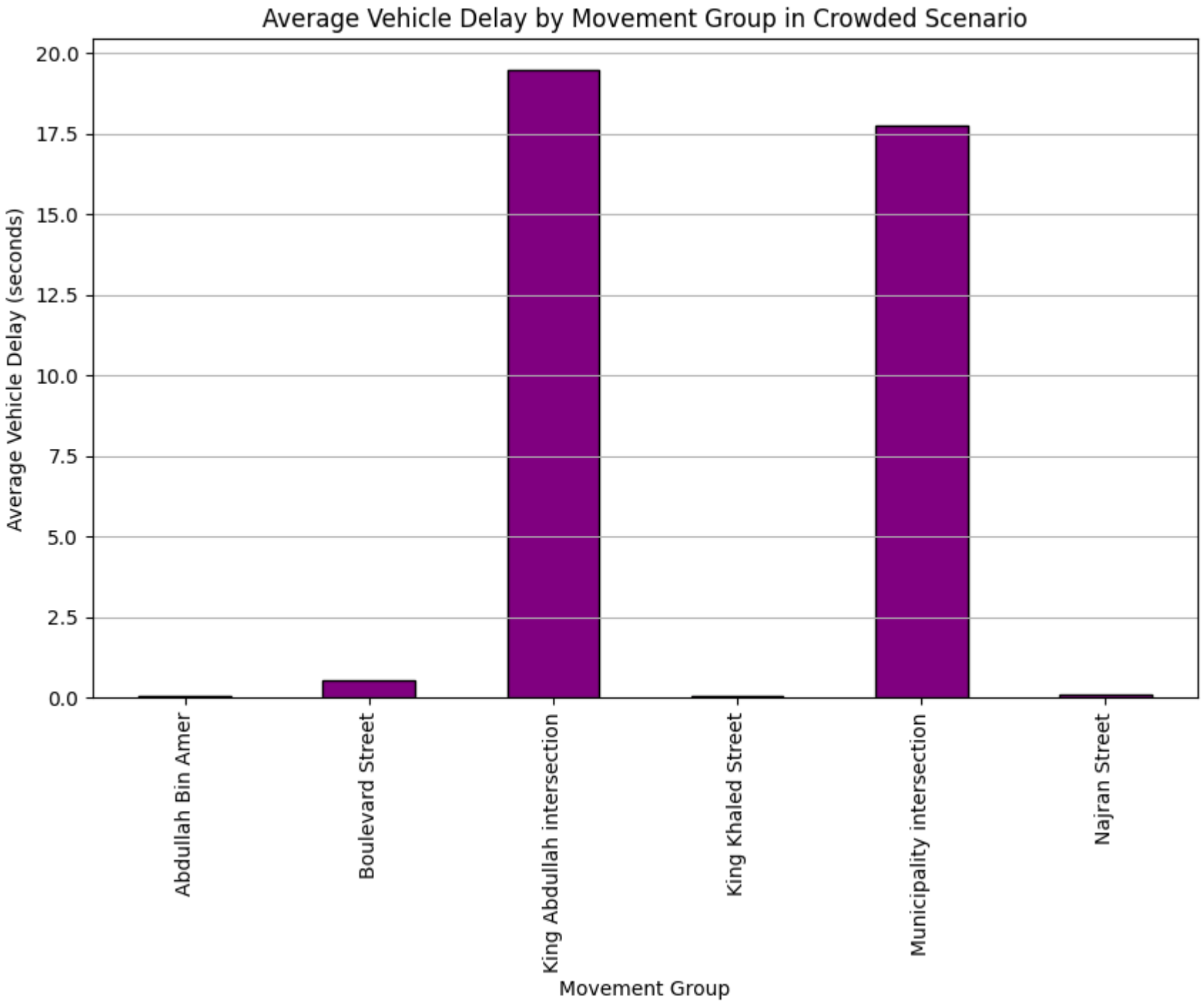
Level of Service



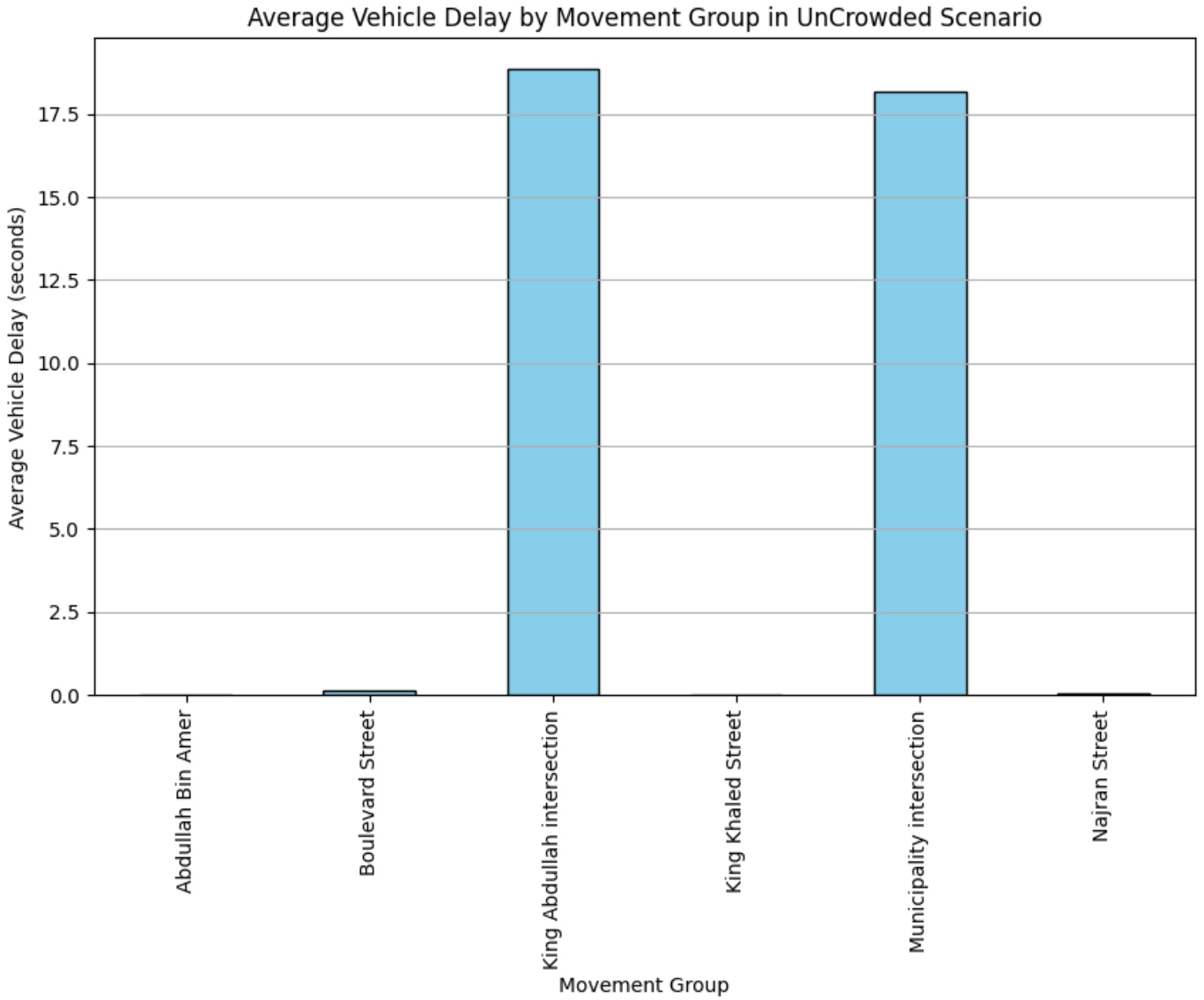
Fuel Consumption



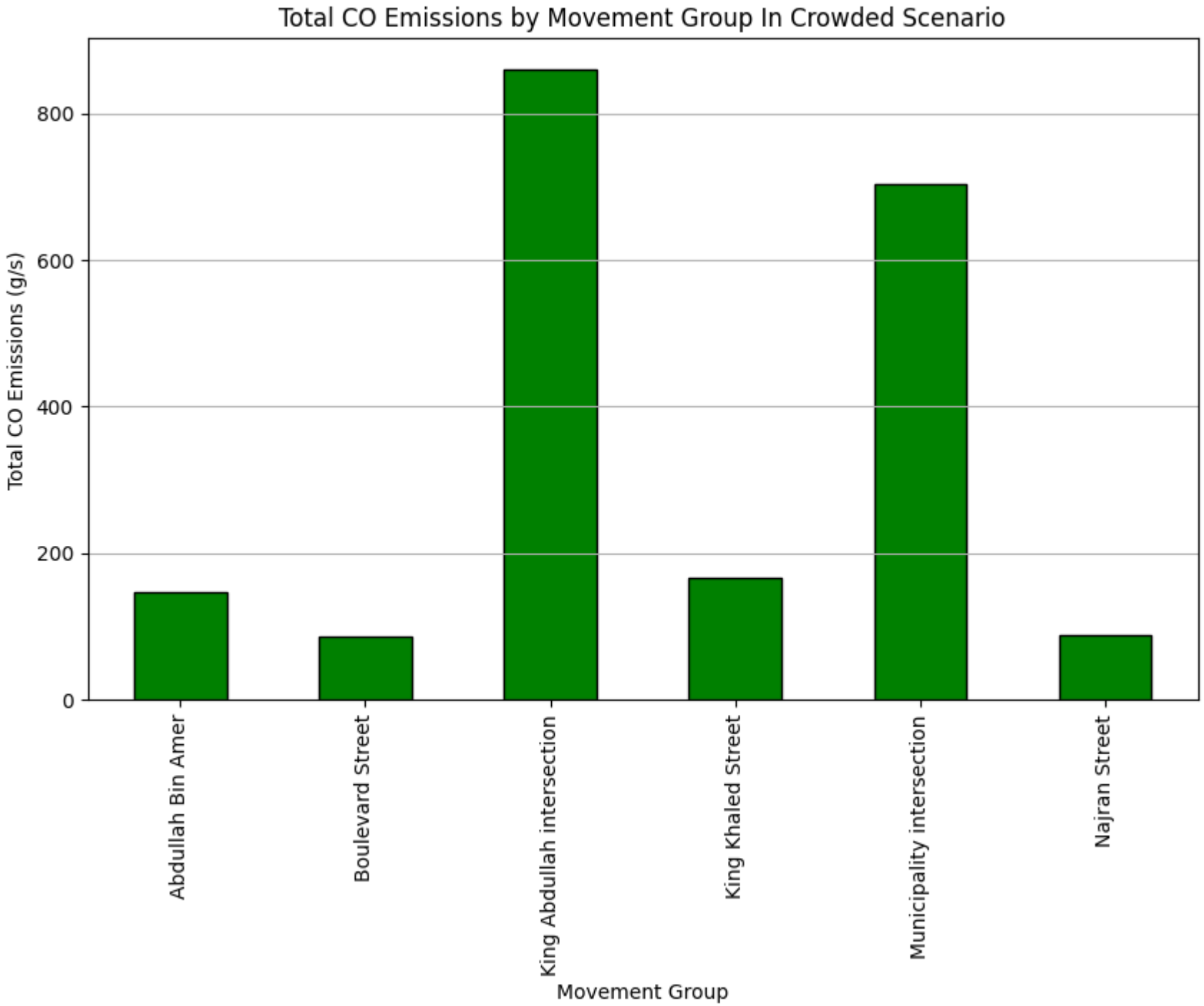
Average Delay in Crowded



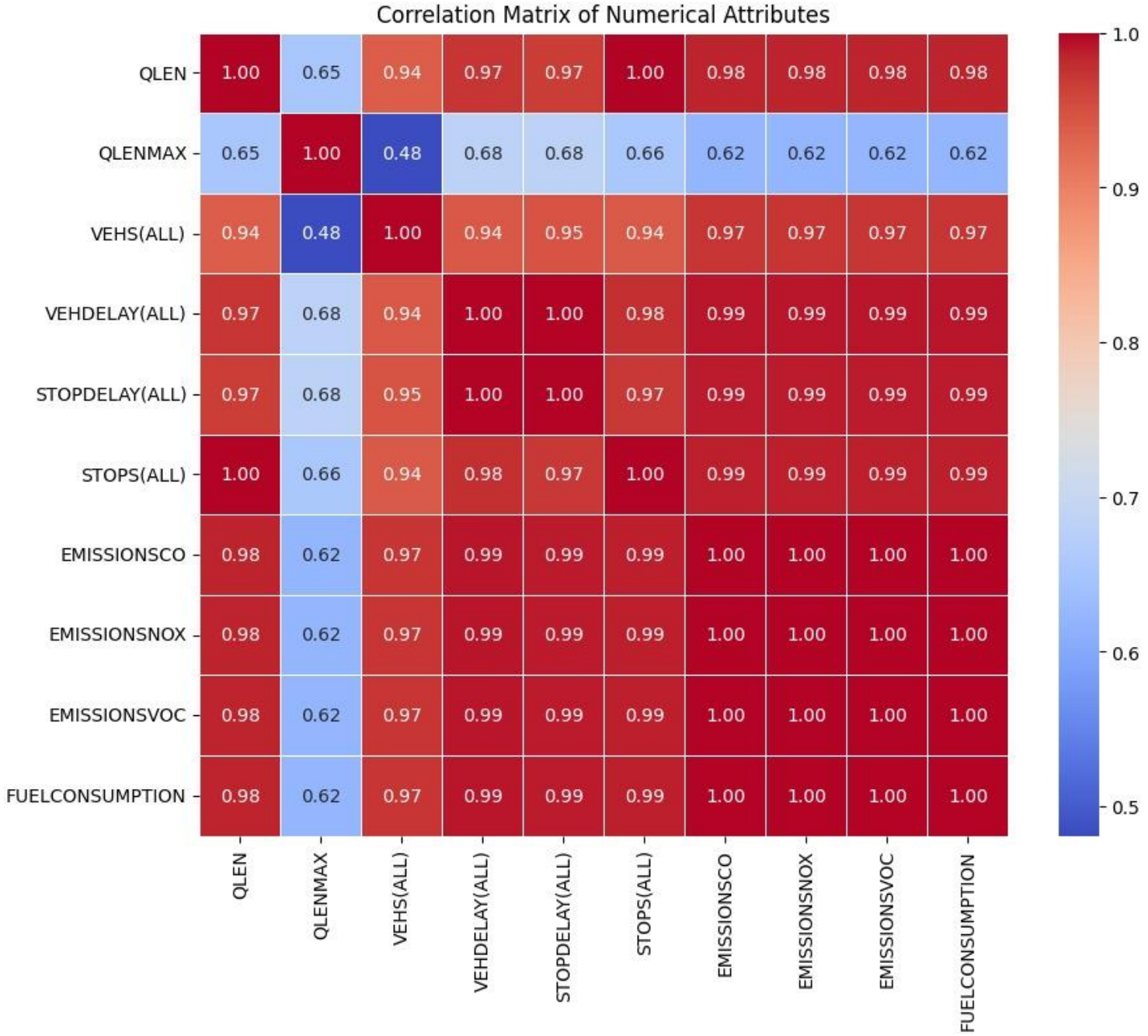
Average Delay in UnCrowded



CO Emissions



Correlation Matrix



Conclusion

Impact of Traffic Congestion: Crowded conditions lead to increased emissions and fuel consumption, which are detrimental to environmental and urban health.

- **Economic Impact:** Increased congestion leads to higher fuel costs and time lost in traffic, which can adversely affect local economies and individual productivity.
- **Health Implications:** Higher emissions contribute to poor air quality, which can negatively impact public health, increasing respiratory problems among urban residents.
- **Urban Planning Recommendations:** Strategies such as improving public transport, creating more efficient traffic signal timings, and encouraging carpooling can mitigate the adverse effects of congestion.
- **Future Considerations:** Emphasize the need for continuous monitoring and adaptive traffic management systems to respond to increasing urbanization and traffic demands.
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