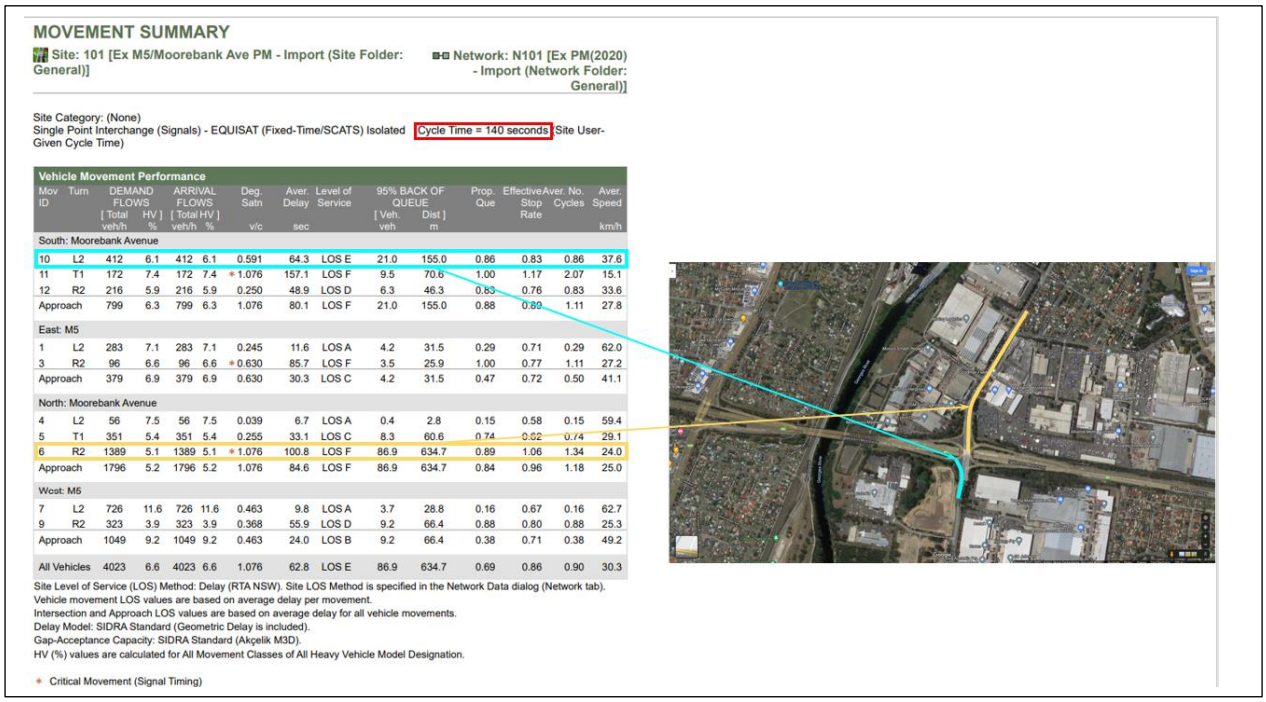
Dear Sir/Madam

We considered the traffic engineering aspects of this project and are more than a little surprised at the limited area that was studied for the largest intermodal in the southern hemisphere.

The M5-Moorebank interchange is the most important intersection for the largest intermodal terminal in the southern hemisphere – and it was done inadequately.

Consider the PM flows in the base year, which for convenience is reproduced below. The location map shows the intersection. The expected queue lengths for both the northbound and southbound movements have also been pencilled in.



MOVEMENT SUMMARY

Site: 101 [Ex M5/Moorebank Ave PM - Import (Site Folder: General)]

Network: N101 [Ex PM(2020) - Import (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Moorebank Avenue														
10	L2	412	6.1	412	6.1	0.591	64.3	LOS E	21.0	155.0	0.86	0.83	0.86	37.6
11	T1	172	7.4	172	7.4	*1.076	157.1	LOS F	9.5	70.6	1.00	1.17	2.07	15.1
12	R2	216	5.9	216	5.9	0.250	48.9	LOS D	6.3	46.3	0.83	0.76	0.83	33.6
Approach		799	6.3	799	6.3	1.076	80.1	LOS F	21.0	155.0	0.88	0.89	1.11	27.8
East: M5														
1	L2	283	7.1	283	7.1	0.245	11.6	LOS A	4.2	31.5	0.29	0.71	0.29	62.0
3	R2	96	6.6	96	6.6	*0.630	85.7	LOS F	3.5	25.9	1.00	0.77	1.11	27.2
Approach		379	6.9	379	6.9	0.630	30.3	LOS C	4.2	31.5	0.47	0.72	0.50	41.1
North: Moorebank Avenue														
4	L2	56	7.5	56	7.5	0.039	6.7	LOS A	0.4	2.8	0.15	0.58	0.15	59.4
5	T1	351	5.4	351	5.4	0.255	33.1	LOS C	8.3	60.6	0.74	0.82	0.74	29.1
6	R2	1389	5.1	1389	5.1	*1.076	100.8	LOS F	86.9	634.7	0.89	1.06	1.34	24.0
Approach		1796	5.2	1796	5.2	1.076	84.6	LOS F	86.9	634.7	0.84	0.96	1.18	25.0
West: M5														
7	L2	726	11.6	726	11.6	0.463	9.8	LOS A	3.7	28.8	0.16	0.67	0.16	62.7
9	R2	323	3.9	323	3.9	0.368	55.9	LOS D	9.2	66.4	0.88	0.80	0.88	25.3
Approach		1049	9.2	1049	9.2	0.463	24.0	LOS B	9.2	66.4	0.38	0.71	0.38	49.2
All Vehicles		4023	6.6	4023	6.6	1.076	62.8	LOS E	86.9	634.7	0.69	0.86	0.90	30.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

The first impression is that the cycle time of 140 seconds is highly unlikely to be accepted by the TfNSW. The traffic engineers would certainly be happier with a smaller cycle time,

If we were to look at the flows from

- South: Moorebank Av – L2 movement (412) and
- North: Moorebank Av – R2 movement (1389)

Combined: 412 + 1,389 = 1,801 vehicles

This compares to SIDRA's capacity of "Exit short lane" and "Merge lane" of 1,800.

The modelled 1,801 vehicles are at the maximum limit of SIDRA's short/merge lane capacity for the M5 on-ramp.

The next observation is that this maximum limit joins the M5 Motorway. Some will travel to the Hume Highway, but most will merge with the M5 Motorway traffic.

SIDRA has a built-in template to model what happens when the traffic on ramps joins the traffic on the Motorway. The two templates can easily be "networked" to form a better view of the situation.

However, before commencing such a modelling task, another SIDRA assumption must be understood.

The image below comes from an old SIDRA User's Manual which we have referred to many times before.

To assist with the interpretation:

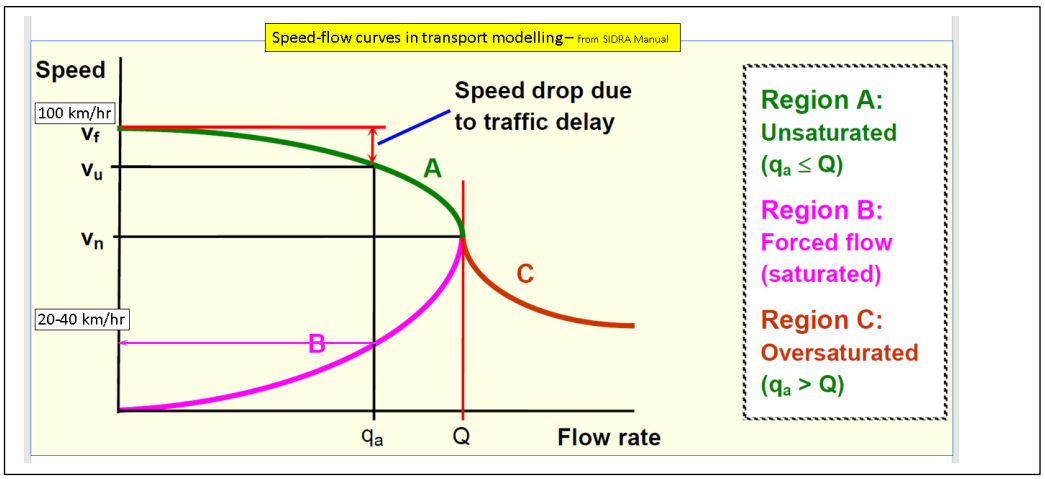
- X – axis is the speed
- Y – axis is the traffic Flow rate

Say, for a 100 km/hr road, and a few drivers on the road, that is low flow rate, the speed is 100 km/hr. As more traffic is added, the speed reduces. Follow the green line.

The capacity of the roadway is indicated Q on the curve.

When more vehicles are added, the traffic will be in the "Forced Flow", Region B (pink curve).

Theoretically, when even more vehicles are added, the pink curve reaches the speed of 0 km/hr. We all have experienced being in a slow-moving car-park – it stops and moves slowly, and stops again etc.



If we only know the Flow rate, say qa, from the graph, the speed could either be on the green line, (Region A, Unsaturated) or on the pink line (Region B, Forced Flow, with a much slower speed, because of congestion).

From the community survey the speed in Lane 1 (where this traffic must merge) is about 20km/hr – 40 km/hr. This indicates the traffic on the M5, flows in Region B "Forced Flow" – pink curve.

Back to the real world:

- intuitively, most of the 1,801 vehicles must merge into traffic that moves at 20km/hr – 40 km/hr.
- traffic in the Forced Flow region has a high traffic density. A condition that is characterised by vehicles travelling close together and there are long delays and very long queues.
- In this case, those long queues will spill back into the M5-Moorebank Av interchange.

Therefore, it is most **unlikely**, that the M5-Moorebank Av interchange operates at Level of Service B.

Like all modelling software packages, the basic assumption is that traffic flows in Region A – indicated by the green line. This is also the case with SIDRA.

Much more work needs to be done to model traffic in Region B. If that were the case, the modelling would correctly show the performance of the M5-Moorebank interchange impacted by the M5 merge spill-back queue.

If the Base year model is not accurate as shown, then the future year modelling work is also inaccurate.

Kind regards
Narelle and Paul van den Bos