Please give careful consideration before increasing the TEU limit to 500,000

Paul van den Bos
18-06-2019

This project was estimated to generate $10 billion of economic over a 30 year period

Detailed Business Case: only requires two modification to the transport infrastructure

- the rail bridge and
- upgrading of Moorebank Av 15 years – after opening

My aim – is to provide you – with enough background – so that this new limit – can be considered properly

I hope – that by the end – you can share my concerns

To me – this increased limit – clearly show – that

whoever provided that advice – has very limited understanding – of the transport and traffic issues

In this booklet:

Left page – my speaker notes – so that I can keep on time

right page – maps, tables and graphs etc. – references are included

Since this is such a complex issue, I will use simple examples

treat flows in one direction only – and consider the AM peak only

Page 38 onwards are answers to possible questions

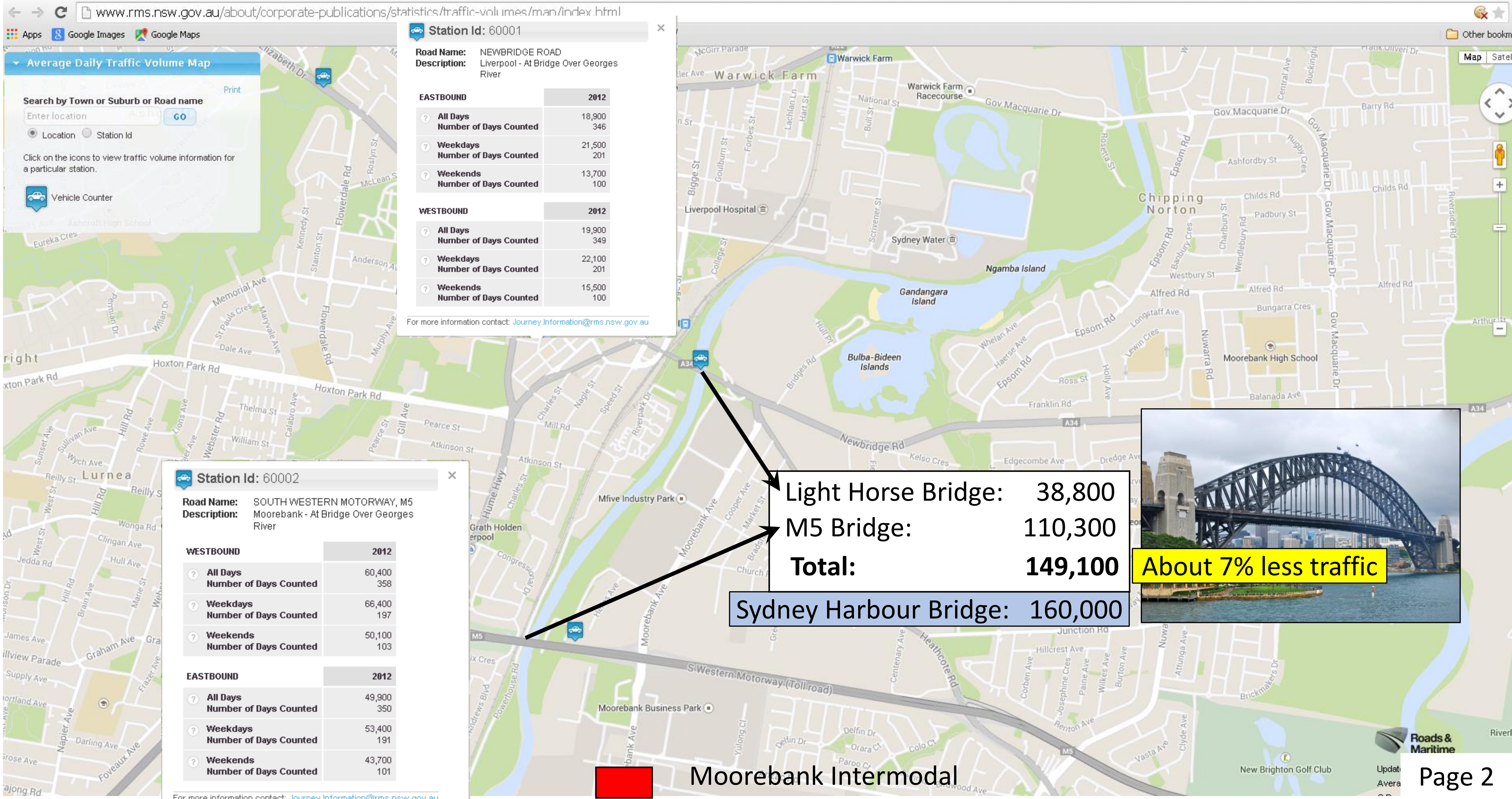
First – a background from a transportation point of view

Page 2 shows the traffic flows –

over the M5 Bridge and Light Horse Bridge – is – 7% less – than the Sydney Harbour Bridge flow

From a transportation point of view – this the – East-West traffic flow

RMS web site: traffic counts – latest available counts – before M5 widening



Station Id: 60001

Road Name: NEWBRIDGE ROAD
Description: Liverpool - At Bridge Over Georges River

EASTBOUND	2012
All Days / Number of Days Counted	18,900 / 346
Weekdays / Number of Days Counted	21,500 / 201
Weekends / Number of Days Counted	13,700 / 100

WESTBOUND	2012
All Days / Number of Days Counted	19,900 / 349
Weekdays / Number of Days Counted	22,100 / 201
Weekends / Number of Days Counted	15,500 / 100

For more information contact: Journey.Information@rms.nsw.gov.au

Station Id: 60002

Road Name: SOUTH WESTERN MOTORWAY, M5
Description: Moorebank - At Bridge Over Georges River

WESTBOUND	2012
All Days / Number of Days Counted	60,400 / 358
Weekdays / Number of Days Counted	66,400 / 197
Weekends / Number of Days Counted	50,100 / 103

EASTBOUND	2012
All Days / Number of Days Counted	49,900 / 350
Weekdays / Number of Days Counted	53,400 / 191
Weekends / Number of Days Counted	43,700 / 101

For more information contact: Journey.Information@rms.nsw.gov.au

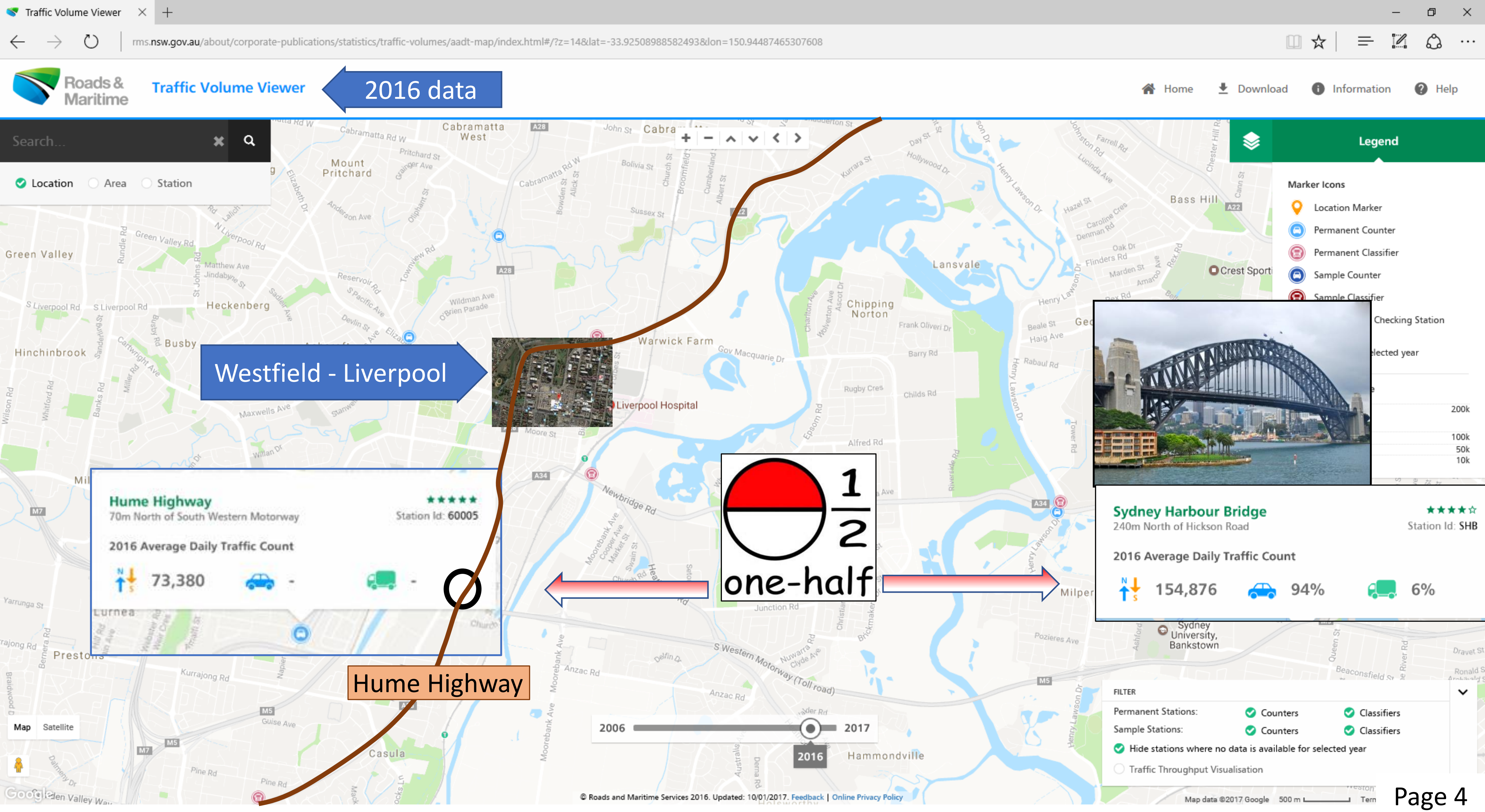
Light Horse Bridge:	38,800
M5 Bridge:	110,300
Total:	**149,100**

Sydney Harbour Bridge: 160,000

About 7% less traffic

Moorebank Intermodal

Page 4 shows that – the <u>North-South traffic flow</u> – is about ½ – of <u>Harbour Bridge flow</u> – (Hume Highway)


Traffic Volume Viewer
rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=14&lat=-33.92508988582493&lon=150.94487465307608
Roads & Maritime
Traffic Volume Viewer
2016 data
Home
Download
Information
Help
Search...
Location
Area
Station
Legend
Marker Icons
Location Marker
Permanent Counter
Permanent Classifier
Sample Counter
Sample Classifier
Checking Station
Westfield - Liverpool
Liverpool Hospital
Hume Highway
70m North of South Western Motorway
Station Id: 60005
2016 Average Daily Traffic Count
73,380
-
-
one-half
Sydney Harbour Bridge
240m North of Hickson Road
Station Id: SHB
2016 Average Daily Traffic Count
154,876
94%
6%
Hume Highway
FILTER
Permanent Stations:
Counters
Classifiers
Sample Stations:
Counters
Classifiers
Hide stations where no data is available for selected year
Traffic Throughput Visualisation
2006
2017
2016
Map
Satellite
© Roads and Maritime Services 2016. Updated: 10/01/2017. Feedback | Online Privacy Policy
Map data ©2017 Google
500 m

Page 6 shows Cambridge Avenue

The shaded white area – represent Moorebank Intermodal

SIMTA EIS 3: states – the crash rate – is about 20 times higher – than the RMS Guidelines

Interestingly,

the increase in crash rates **resulting from the Proposal alone**

-> is higher than the recommended RMS Guidelines

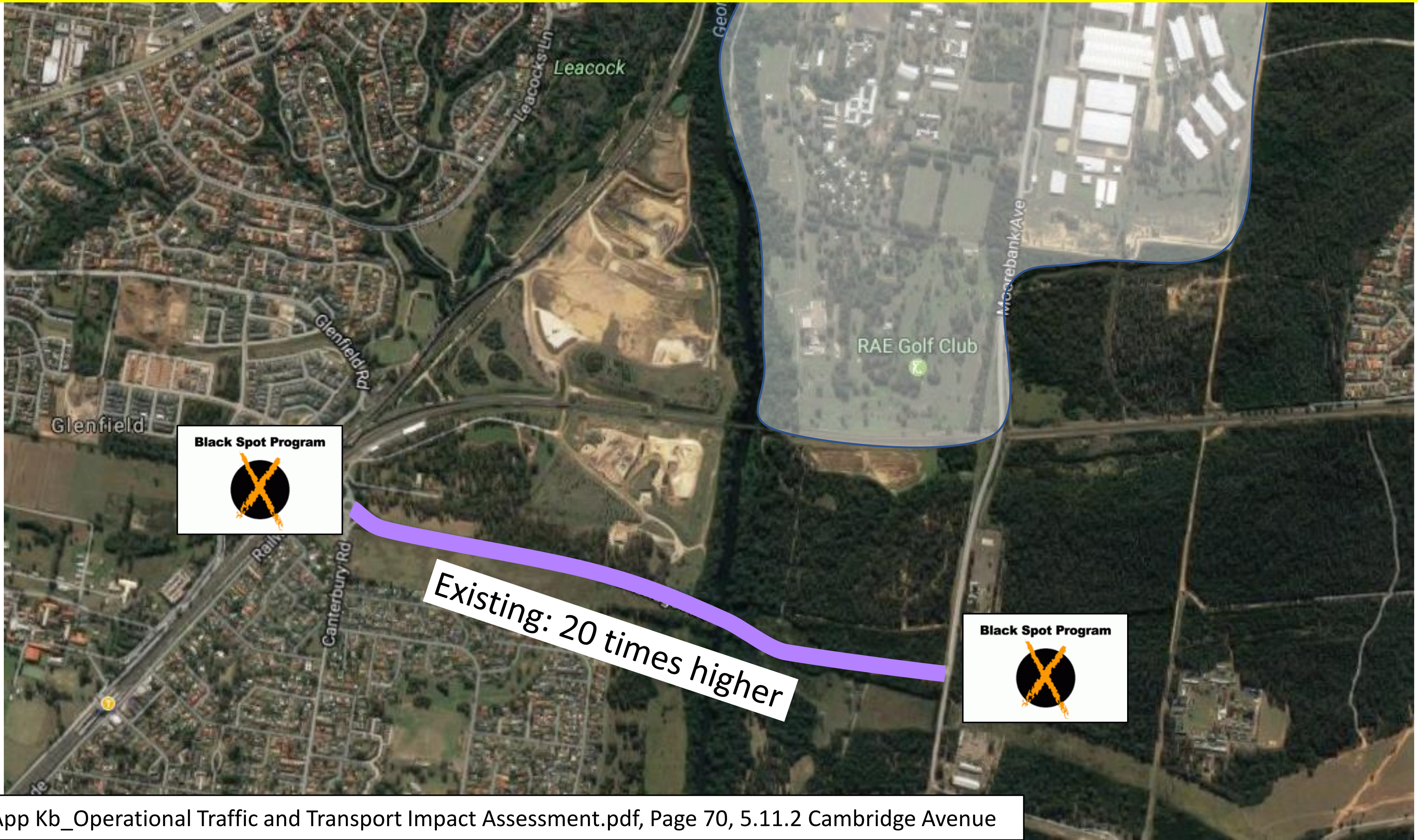
RMS guideline 0.13 crashes per km per year

SIMTA EIS 3:

Existing: 5.0 crashes per year on 1.8 km roadway = 2.78 crashes per km per year (about 20 times higher than RMS Guideline)

Additional traffic: 0.3 crashes per year on 1.8 km roadway = 0.17 crashes per km per year (increase is higher than RMS Guideline)

Combined: 5.3 crashes per year on 1.8 km roadway = 2.94 crashes per km per year



2016-12-13 MPES2 EIS_App Kb_Operational Traffic and Transport Impact Assessment.pdf, Page 70, 5.11.2 Cambridge Avenue

Page 8 – Moorebank Avenue – it is a very similar story

The **additional traffic alone**
is expected – to generate a **crash rate** – **4 times higher** – than the RMS Guidelines

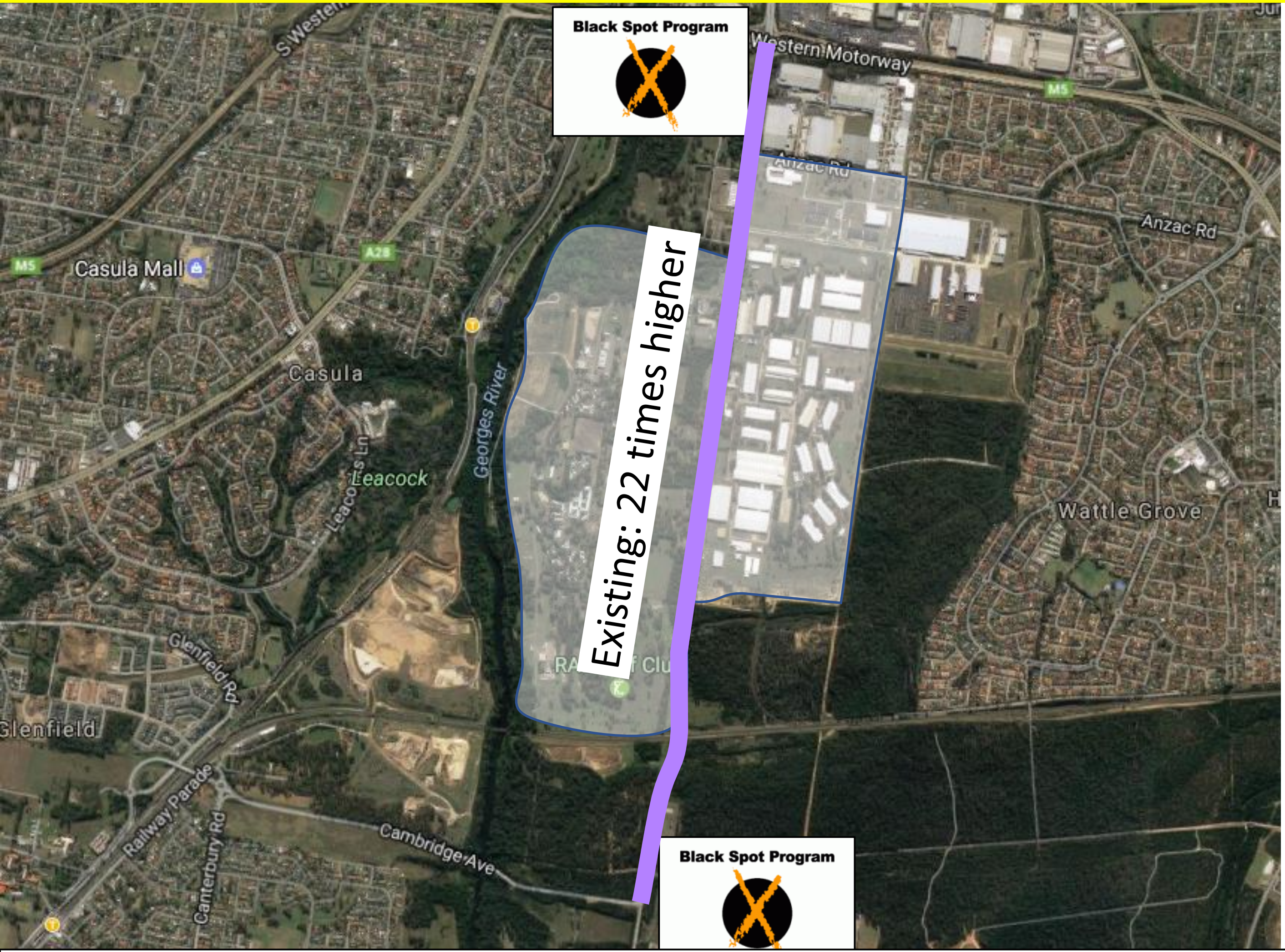
RMS guideline 0.13 crashes per km per year

SIMTA EIS 3:

Existing: 10.2 crashes per year on 3.5 km roadway = 2.91 crashes per km per year (about 22 times higher than RMS Guideline)

Additional traffic: 1.9 crashes per year on 3.5 km roadway = 0.54 crashes per km per year (4.3 times higher than RMS Guideline)

Combined: 12.1 crashes per year on 3.5 km roadway = 3.46 crashes per km per year



2016-12-13 MPES2 EIS_App Kb_Operational Traffic and Transport Impact Assessment, Page 69, %.11.1 Moorebank Avenue

Page 10 shows a table – comparing crash statistics – reported – in SIMTA EIS 1 – and – SIMTA EIS 2

There is about – a 20% increase – over 5 years

SIMTA EIS 3 – used a different study area – we could incorporate – those results

SIMTA
SYDNEY INTERMODAL TERMINAL ALLIANCE

Vehicle collisions

Crash Data from SIMTA EIS – Earlier + Current

- SIMTA EIS 1 examined crash data from 2004 to 2009 (five years)
- SIMTA EIS 2 examined crash data from 2009 to 2013 (five years)
- Ref:
  - **Earlier EIS**: 17. Appendix Transport and Traffic Assessment Volume 1.pdf, page 16
  - **Current EIS**: Appendix L_SIMTA Stage 1_Traffic and Accessibility Impact Assessment.pdf, page 18

	SIMTA EIS 1	SIMTA EIS 2	
Years of data analysis	**2004 - 2009** ↑	**2009 – 2013** ↑	
Number analysed	559	524	
Fatalities			
Injuries	**240**	**284**	**Nearly 20% increase**
Heavy vehicle crashes	**59**	**71**	**Over 20% increase**
Light Commercial vehicles	106	111	
Cars	520	487	
Total vehicles	685	669	

previous 5 years | last 5 years before M5 widening

SIMTA EIS 3 – after M5 widening – contains only 65% of numbers of vehicles - cannot compare changes

Page 12 shows the crash rate – on the M5 – is – about 40 times higher – than the RMS guideline

This data comes from MICL EIS

MICL EIS also spells out:

- "(this) existing congestion point within the motorway network … is forecast to increase with the widening of the M5 Motorway as there are no plans to mitigate the congestion caused by the weaving movement between Moorebank Avenue and the Hume Highway"

Ref: Parsons Brinckerhoff 11-46

"This effect (crashes etc.) could be compounded by the RMS' planned widening of the M5 Motorway to both the east and west of Moorebank Avenue"
Ref: Parsons Brinckerhoff 11-6

The MICL EIS implies

The M5 Widening – funnels more traffic – into this congested section

with very predictable results – more crashes – slower speeds – lower traffic through-put

RMS guideline 0.13 crashes per km per year

MICL EIS:
Existing: 4.89 crashes per km per year (almost **40 times higher than RMS Guideline** – before the M5 Widening)

013 Moorebank IMT Project_ Chapter 11_ Traffic, transport and access.pdf, Page Parsons Brinckerhoff **11-16**

Economics

Page 14 from SIMTA EIS 1

SIMTA catchment area – in 2016 – and – in 2025

In 2025 – the SIMTA catchment area – is greatly reduced

NSW Government submission to Infrastructure Australia

- for economic reasons – SIMTA should be operational by 2016 – rather than in 2021

RTA website's statement – refers to a 2013 start

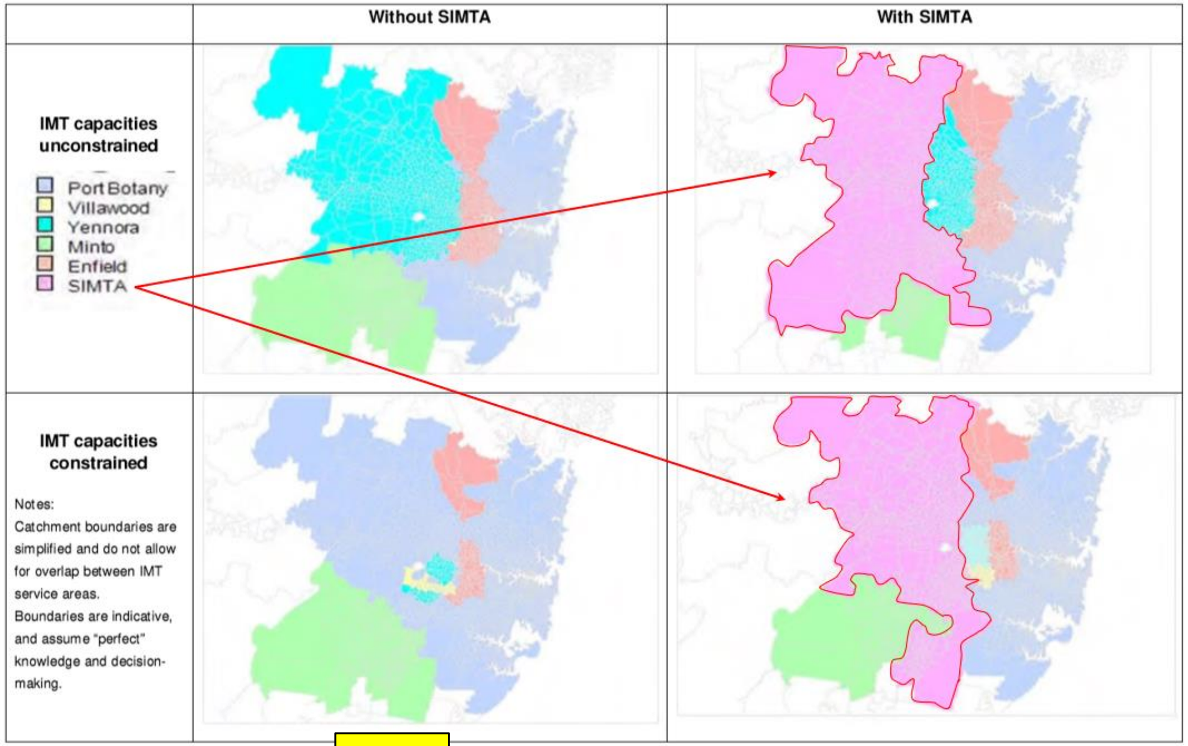


Figure 4-5 IMT Catchment maps – 2016 **2016**

Moorebank Intermodal Terminal Facility (MITF)—Traffic and Transport
Hyder Consulting Pty Ltd-ABN 76 104 485 289 Page 69
\\hc-aus-ns-fs-01\jobs\aa003210\d-calculations\traffic and modelling_post dgr\main report_traffic july11\final report post adequacy_nov11\aa003210_main traffic report_rev h.docx

17. Appendix K_ Transport and Traffic Assessment Volume 1, Page 69

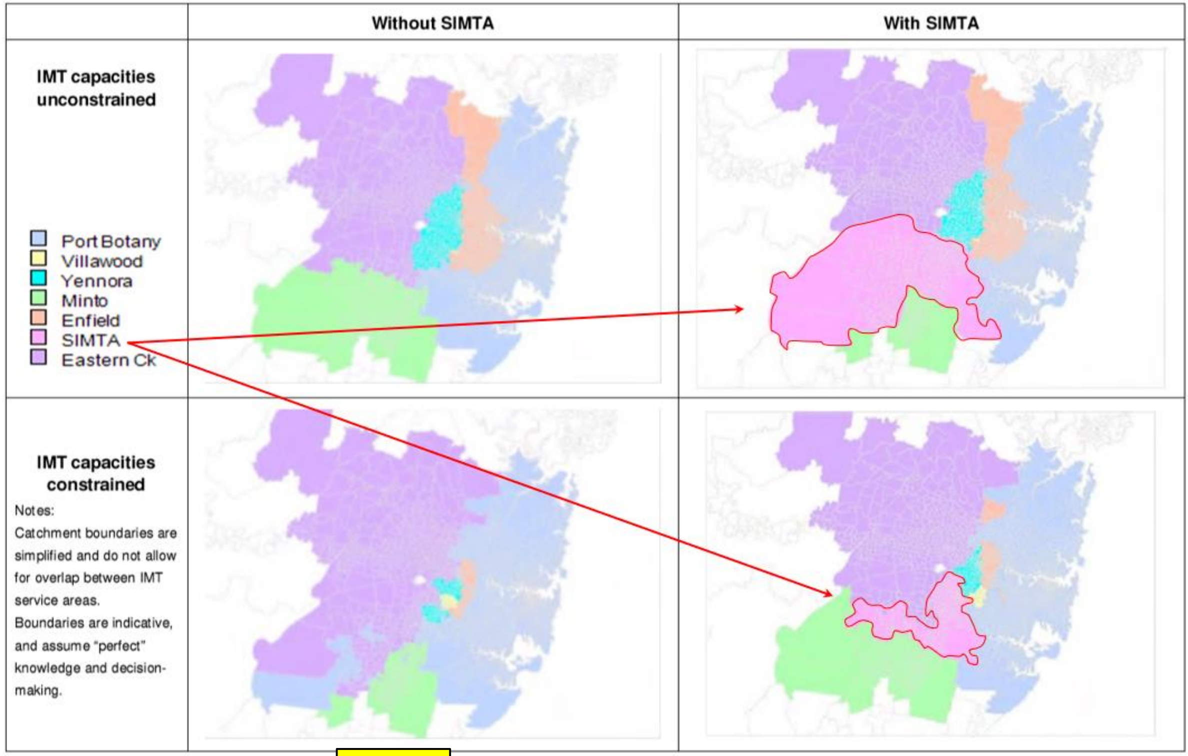


Figure 4-6 IMT Catchment maps – 2025 **2025**

Moorebank Intermodal Terminal Facility (MITF)—Traffic and Transport
Hyder Consulting Pty Ltd-ABN 76 104 485 289 Page 70
\\hc-aus-ns-fs-01\jobs\aa003210\d-calculations\traffic and modelling_post dgr\main report_traffic july11\final report post adequacy_nov11\aa003210_main traffic report_rev h.docx

17. Appendix K_ Transport and Traffic Assessment Volume 1, Page 70

- *NPV analysis indicates that introducing SIMTA's Moorebank Intermodal Terminal in 2016, rather than the alternative option 2021, delivers a preferable economic outcome.*

17. Appendix K_ Transport and Traffic Assessment Volume 1, Page 28, **2.3.6 NSW Government Submission to Infrastructure Australia**

It is expected that detailed design and approval of the Moorebank Intermodal Freight Terminal project would be completed by mid-2012 and, subject to planning outcomes, the staged development of the Intermodal Terminal would be expected to start in 2013.
http://www.rta.nsw.gov.au/roadprojects/projects/building_sydney_motorways/images/orbital/index.html#lb-moorebank **accessed Friday 17th August 2012**

Summary from – a **transportation point of view**

Strange – to build something so big – with such a short – economic life span

in an area – with east-west traffic volumes – similar – to Sydney Harbour Bridge flow

And north-south traffic volumes – half – of the Harbour Bridge flow

in a local network – having crash rates – 20 and 40 – times higher – than the RMS Guidelines

Now the planning is about Sydney's Aerotropolis – see Page 16

A new city – the yellow area – it is about twice – the size of Brisbane

Therefore, it needs freight – about twice – Brisbane's freight volume

NSW Government Freight policy **appears** to be

Rail – the containers to Moorebank – black line

Truck – the containers to Aerotropolis – purple line

The quickest way – is to go over the M5 Bridge – with its high crash rate

Given the background – the traffic analysis – does not show – a pretty picture

Let us look – into the first level – of technical issues

- Please stop me – if I go too fast – but there is fair bit – I want to cover

For planning purposes: yellow area

Population 2 *Brisbane Freight = 2 * Brisbane

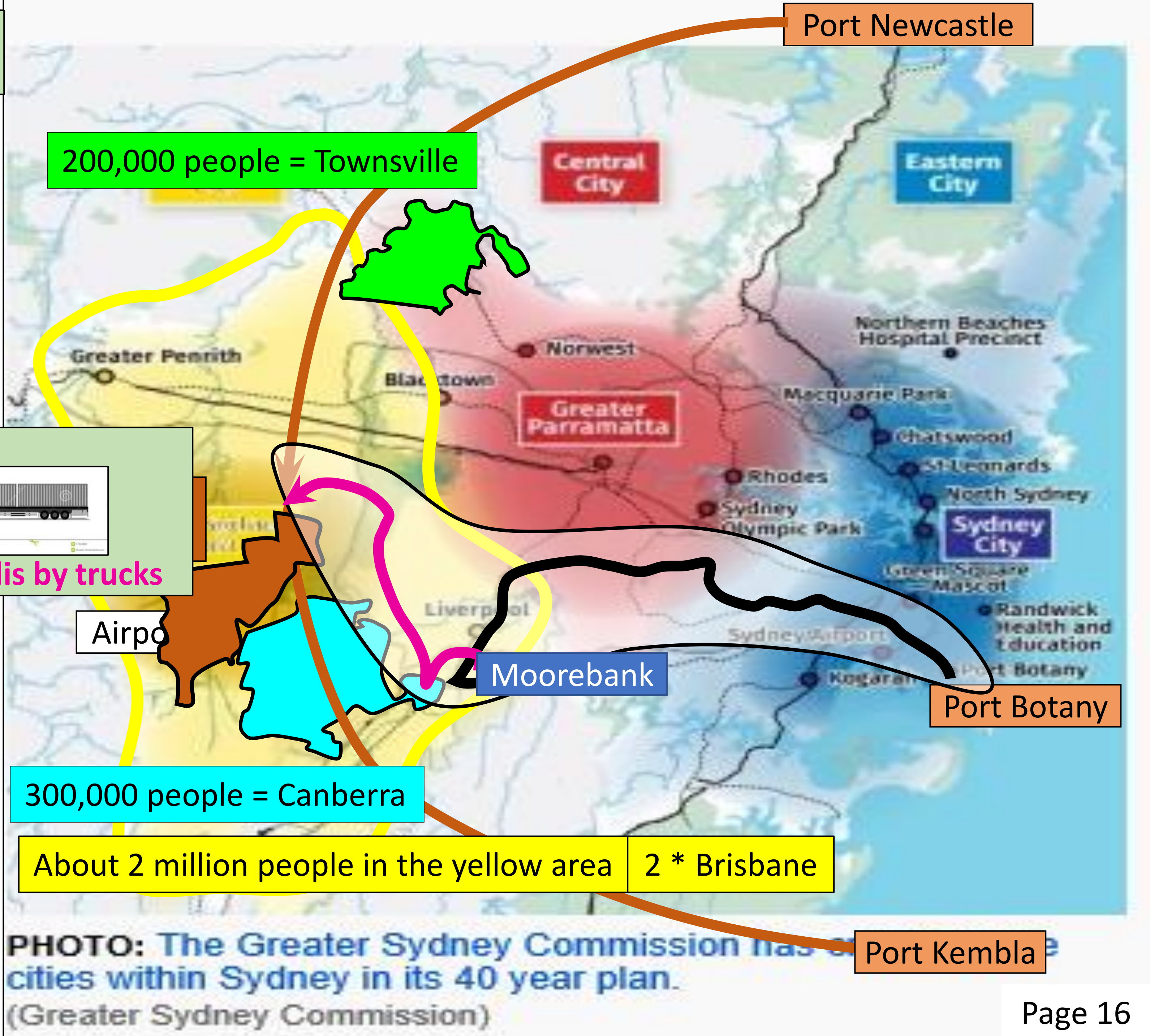
Current freight policy appears to be:

- **Rail to Moorebank**
- **Truck to Aerotropolis**

In other words, 100% of freight to Aerotropolis by trucks

Possible options:

- **Port Newcastle**
- **Port Botany**
- **Port Kembla**
- **combination**



Page 18 has a lot of information – one step at the time

First, top right-hand side

This is output – from a software package – used to calculate – the “green” times – at traffic signals

Underneath the Parsons Brinckerhoff logo -

- I-05 Intersection of the Hume Highway and Reilly St

Below it – next to the traffic light icon:

- I-05 2030 Base AM – about 10 years from now - and no intermodal traffic

I have put a brown box – around the 464.0 number

It is a mathematical model – and hence its accuracy

Its column title – 95% of Back of Queue Distance (metres) - simply: the queue length

The blue arrow points to South (approach): Hume Highway (S) *(southern approach)*

This queue – is plotted on the Google Map

The Brown arrow – points to the distance – this is rough – but good enough – for illustrative purposes

Notice – that the Reilly queue – blocks – the M5 Motorway and Hume Highway intersection

- see the Red Box?

I-05 Intersection of the Hume Highway and Reilly Street

MOVEMENT SUMMARY

Site: I-05 2030 BASE AM

Hume Highway / Reilly Street
2030 BASE AM PEAK 7:45 am - 8:45 am
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hume Highway (S)											
1	L2	80	2.6	0.922	27.7	LOS B	64.3	464.0	0.80	0.80	38.2
2	T1	3145	3.6	0.922	21.5	LOS B	64.3	464.0	0.74	0.75	38.5
3	R2	14	7.7	0.099	22.4	LOS B	0.5	3.6	0.48	0.67	37.1
Approach		3239	3.6	0.922	21.6	LOS B	64.3	464.0	0.74	0.75	38.4
East: Congressional Drive (E)											
4	L2	49	2.1	0.263	59.1	LOS E	5.9	42.6	0.89	0.74	24.5
5	T1	46	4.5	0.263	54.5	LOS D	5.9	42.6	0.89	0.74	24.0
6	R2	91	4.7	0.430	67.3	LOS E	6.1	44.6	0.95	0.79	18.7
Approach		186	4.0	0.430	61.9	LOS E	6.1	44.6	0.92	0.76	21.6
North: Hume Highway (N)											
7	L2	32	3.3	0.547	17.8	LOS B	21.3	158.2	0.52	0.56	39.5
8	T1	[illegible]	7.2	0.547	11.0	LOS A	24.5	182.4	0.49	0.48	46.6
9	R2	99	1.1	0.767	58.8	LOS E	6.2	43.8	1.00	0.94	22.9
Approach		1940	6.8	0.767	13.5	LOS A	24.5	182.4	0.52	0.51	44.1
West: Reilly Street (W)											
10	L2	121	4.3	0.277	50.4	LOS D	7.7	56.1	0.83	0.76	24.4
11	T1	14	7.7	0.277	45.8	LOS D	7.7	56.1	0.83	0.76	25.6
12	R2	235	1.8	1.033	151.3	LOS F	26.1	185.6	1.00	1.22	14.4
Approach		369	2.8	1.033	114.3	LOS F	26.1	185.6	0.94	1.05	16.5
All Vehicles		5735	4.7	1.033	26.2	LOS B	64.3	464.0	0.69	0.69	35.5

Page 20 - this is that blocked intersection

Below Parsons Brinckerhoff logo – **Intersection of M5 Motorway and Hume Highway**

Same routine – Brown box = 1100.9 m queue length

Plot queue length on Google maps – distance = 1.10 km

Notice – that this queue – blocks – Graham Av – and – De Meyrick Av – traffic lights

Red box with the number 469.4

It has a red arrow – pointing to the queue – on the Hume Highway on-ramp

The queue stretches – close to – where we see – the water of the River

Two more data items – from this table

same row – on the left – the red shaded box – with the number 1.214

Its column title: **Degree of Saturation**

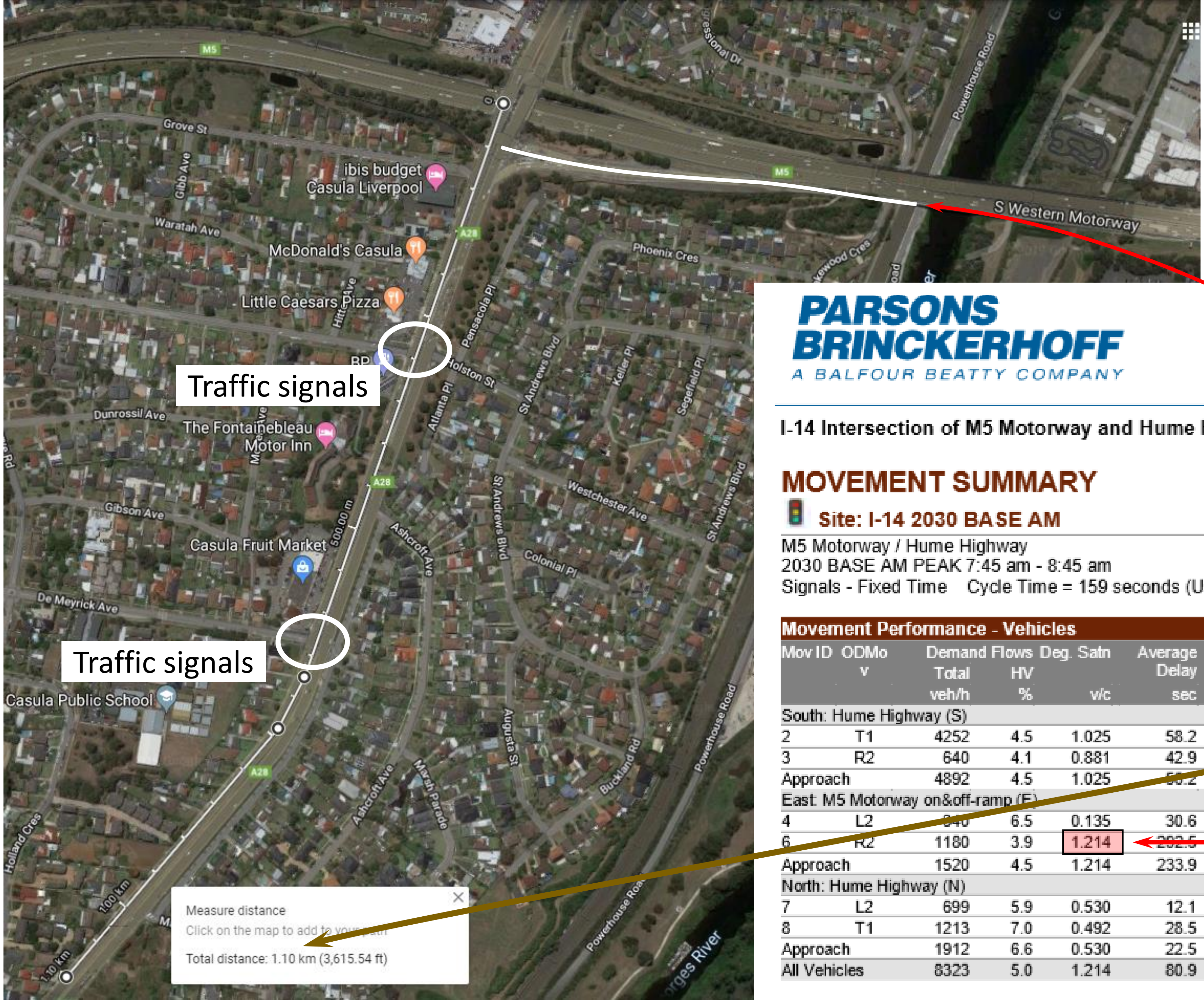
Also

same row – on the right – the Purple box – with 1.43

its column title: **Effective Stop Rate per vehicle**

On average – every right turning vehicle – must stop 1.4 times

About 25% – of the heavily loaded Intermodal trucks – turn right here – see Pages 49 and 50



PARSONS BRINCKERHOFF
A BALFOUR BEATTY COMPANY

Appendix H - 2030 SIDRA Results with and without Moorebank IMT

I-14 Intersection of M5 Motorway and Hume Highway

MOVEMENT SUMMARY

Site: I-14 2030 BASE AM

M5 Motorway / Hume Highway
2030 BASE AM PEAK 7:45 am - 8:45 am
Signals - Fixed Time Cycle Time = 159 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hume Highway (S)											
2	T1	4252	4.5	1.025	58.2	LOS E	151.4	1100.9	1.00	1.20	33.5
3	R2	640	4.1	0.881	42.9	LOS D	17.4	125.8	1.00	0.90	37.8
Approach		4892	4.5	1.025	58.2	LOS D	151.4	1100.9	1.00	1.16	34.1
East: M5 Motorway on&off-ramp (E)											
4	L2	340	6.5	0.135	30.6	LOS C	4.8	35.8	0.60	0.71	41.9
6	R2	1180	3.9	1.214	232.5	LOS F	64.9	469.4	1.00	1.43	8.6
Approach		1520	4.5	1.214	233.9	LOS F	64.9	469.4	0.91	1.27	11.3
North: Hume Highway (N)											
7	L2	699	5.9	0.530	12.1	LOS A	18.8	138.4	0.45	0.71	47.3
8	T1	1213	7.0	0.492	28.5	LOS C	17.9	132.8	0.62	0.55	43.3
Approach		1912	6.6	0.530	22.5	LOS B	18.8	138.4	0.56	0.61	[illegible]
All Vehicles		8323	5.0	1.214	80.9	LOS F	151.4	1100.9	0.88	1.06	

<u>Why do we see queue lengths – longer – than – the distance between intersections?</u>

Answer:

the software has a switch – which enables intersections to be connected – into a network

The mathematics – incorporates all movements – including departing vehicles

In a network – if a queue – blocks – a departing vehicle – that departing vehicle – cannot move

The vehicles behind it – also cannot move

Any newly arriving vehicle – must queue – behind – those blocked departing vehicles

This is a simplified explanation – of how grid-locked networks – are calculated

Parsons Brinckerhoff – treated each intersection – **as an isolated intersection**

Hence – queue lengths – can be – longer – than the distance – between intersections

Therefore – a better question is:

why did the modellers **<u>not</u>** "flick that network switch?"

That is – a question for the Commissioners to ask – those modellers – see Page 36 for other possible questions

Intuitively – if – the degree of saturation is 100% or 1.0 –– it is fully saturated
I just wanted you to see – a number – **higher** than 1.0 – we saw: 1.214

<u>How can we have a degree of saturation of 1.2?</u>

This is a mathematical model –
In simple terms – more vehicles – want to make a movement – than – the theoretical capacity
In this case – 20% of the vehicles – want to turn right – but could not
Think of those Intermodal trucks – 20% – <u>will **not** be able to turn right</u>
That is – in addition – to the 1.4 stop rate

<u>What would the impact be – if a "networked" model – was used?</u>

Clearly – in this case – the queues would grow – very long and
spill even further – onto the M5 Motorway
Such a long queue – would reduce – the distance
– available – for the weaving and merging movements

I like to go ½ step deeper – into the technical area

Page 24 shows a graph – from the Australian Research Report 341

We are looking at – the relationship – between

- vehicle spacing – on the Y axis – and
- speed – on the X axis – for a 100 km/hr roadway

This data – is from a Freeway in Melbourne
This is technically identical – to the M5 Motorway – in front of Moorebank Intermodal

Top right hand side – we see a representative picture – of a few vehicles on the road

The arrow points to – the spacing between vehicles – in this case – the spacing is large – do not worry about numbers

Middle of the right hand side – the picture shows more vehicles

The arrow points to a shorter spacing
Note – the speed is 100 km/hr

In the middle of the graph we see a blue arrow – indicating – critical spacing

Here the green curve changes to the red curve

As more vehicles are added to the roadway – the average speed drops – very quickly – and so does the spacing

As Professor Mike Florian would say, – we have too many cars on the road

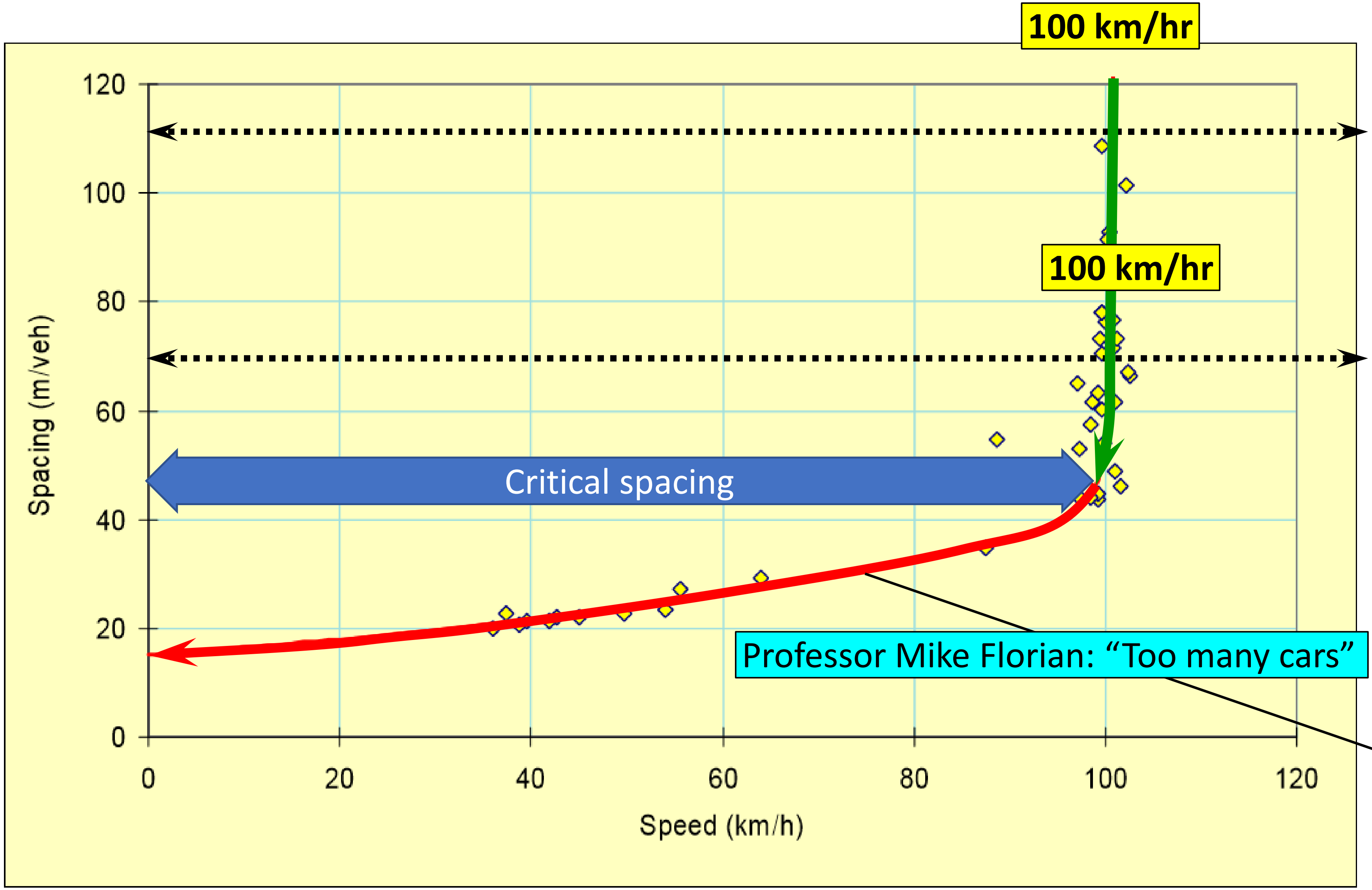




Figure 6.2 - Estimated and measured spacing - speed values for the freeway basic segment data collected in Melbourne (described in ARR 341)

http://www.sidrasolutions.com/Cms_Data/Contents/SIDRA/Folders/Resources/Articles/Articles/~contents/TXUJ8KTFPDGXXRBZ/AKCELIK_SpeedFlowModels(CAITR%202003)v1.pdf

Page 26 shows the – SIMTA EIS 1 – surveyed speed – on the M5 Bridge (about 10 years old)

And the speeds – collected by members – from our community – see Pages 43 to 46

Blue Arrows point to the expected spacing – between vehicles

Length of a B-triple is also shown

(this is the preferred mode of transport – for Moorebank Intermodal)

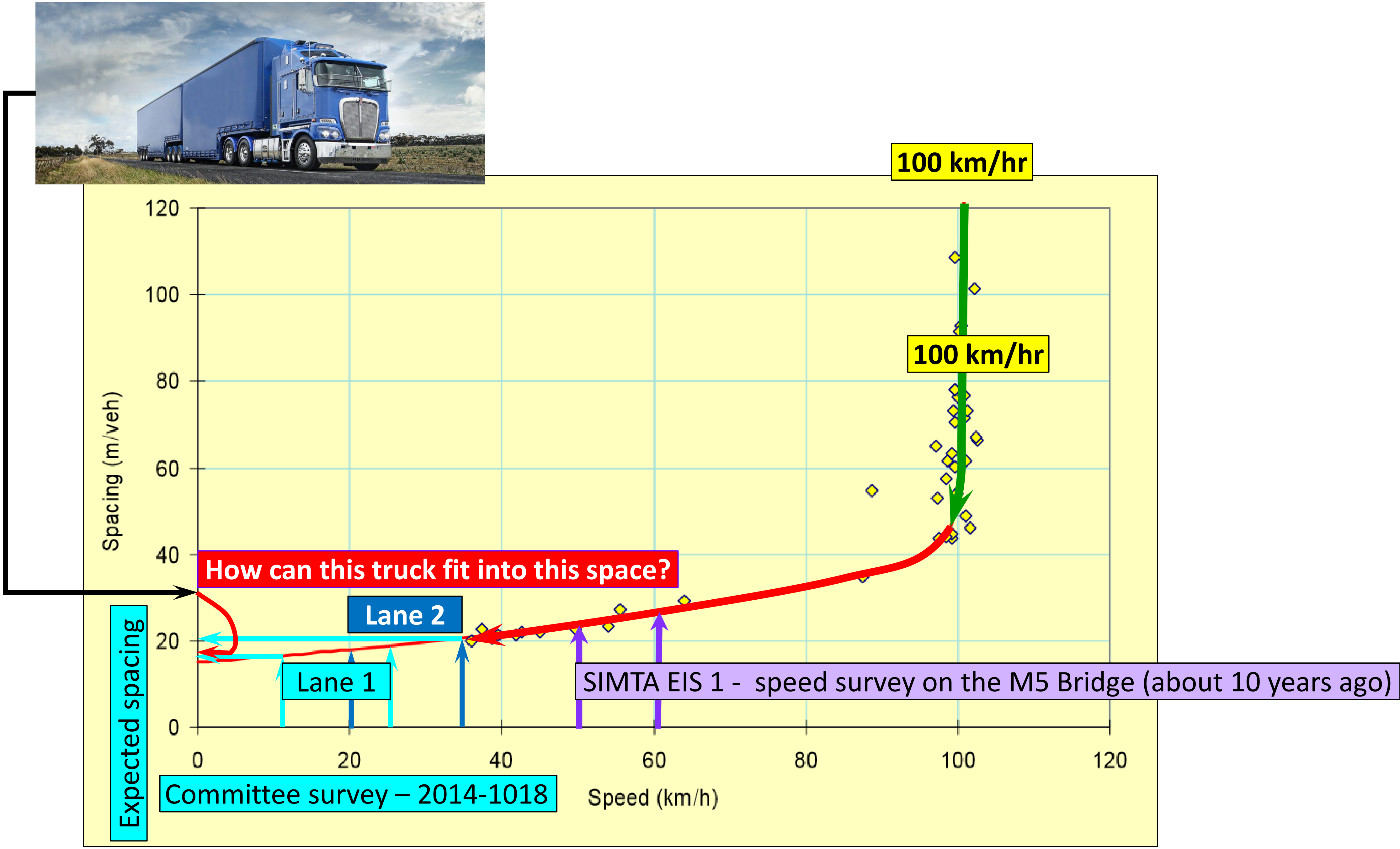
How can a large truck – fit into a small space – safely – and – at speed

In addition – from the intersection analysis on Page 20

– with the queue – spilling far – onto the M5 Bridge – the distance – for lane changing – is short

- *(merging + weaving movement)*

How many trucks – are expected – to change lanes?



100 km/hr
100 km/hr
120
100
80
60
40
20
0
Spacing (m/veh)
How can this truck fit into this space?
Lane 2
Lane 1
SIMTA EIS 1 - speed survey on the M5 Bridge (about 10 years ago)
Expected spacing
0
20
40
60
80
100
120
Committee survey – 2014-1018
Speed (km/h)

In the case of Toll Road modelling – the modellers – were asked – to generate numbers as high as possible

In the case of Intermodal modelling – the modellers – were asked – to generate numbers as low as possible

Page 28 shows – the TfNSW response – to SIMTA EIS 1
modellers – should have used truck numbers
about 10 times higher in their modelling work

For comparison purposes – factor the TfNSW number – to 1 million TEUs

Reference TfNSW submission to SIMTA EIS 1

CD12/05199

6.5 Truck traffic generation - what the response to submissions should provide

TfNSW considers that the estimated truck traffic generated from the SIMTA proposal (approximately 2,600 daily truck movements) appears low. TfNSW considers it more likely that an intermodal terminal with 1 million TEU from Port Botany and a 1.0 million TEU rail operation from Inter State will generate approximate 20,700 daily truck movements. This is ten times more than the truck generation estimated for the SIMTA proposal.

TfNSW 2,000,000 TUEs = 20,700 daily truck movements

equivalent to: **1,000,000 TUEs = 10,350 daily truck movements** – for comparison purposes

Page 30 comes from Nell's first book

This table is a sanity check – of truck volumes – for all Intermodals – in Sydney

This is based – on the freight data base – downloaded – from the NSW Government web site

The yellow column – shows the truck numbers – factored up to 1 Million TEUs

The last two lines are of interest

the average is roughly – 4 times higher – than TfNSW figure

A Sanity Check

Intermodal	TEU	Daily Flow	Factored to 1 Mil TEU	Comment
Port Botany	2,000,000	4,700	2,350	No warehousing
Camellia	80,000	5,100	63,300	Warehousing
Chullora	300,000	7,400	24,800	Warehousing
Enfield	300,000	1,500	4,900	EIS Warehousing
Leightonfield	80,000	7,600	95,000	Warehousing
Minto	150,000	5,000	33,000	Warehousing
Yennora	170,000	6,000	35,000	Warehousing
SIMTA	1,000,000	2,600	2,600	Warehousing
Average			42,666	
TfNSW	2,000,000	20,700	10,350	

Roughly four times higher

Ref: Moorebank Intermodals, Key assumptions require deeper scrutiny, Page 13 (detailed references provided in that document)

How many lane-changing trucks for 500,000 TUEs?

See Page 35 for the details – About 65% of the trucks

That is 12.4 seconds between trucks in one direction , and
12.4 seconds between trucks in the other direction

Page 32 summarises its implementation

Fitting a large truck – into a small space – with high frequency – at speed – within a short distance

Unfortunately – all this – is a gross – over-simplification

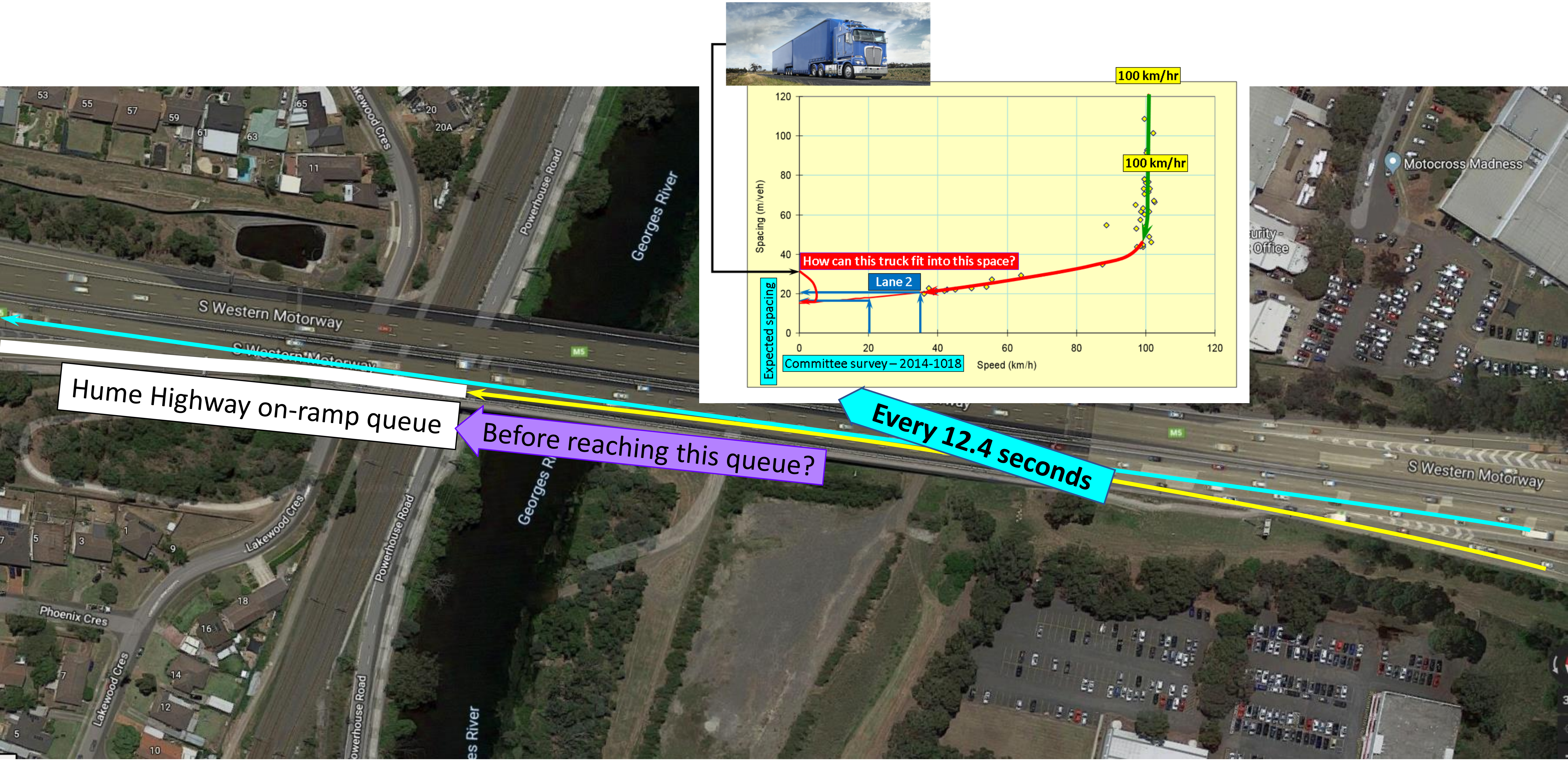
- The community survey showed – that Lane 1 – and – Lane 2 – operate – at different speeds – Page 26
- Trucks have to change lanes – from a slower speed lane – into – a high speed lane
- At the same time – the M5 traffic wanting to exit – have to change –
  from a faster speed lane – into – a slower speed lane
- Both these movements – have to occur – within – the restricted length

Finally

Page 26 showed – that the speed has reduced – since SIMTA's survey

It is highly likely – that in the future –

the speed – will reduce further even further – resulting – in even smaller gaps



100 km/hr
100 km/hr
How can this truck fit into this space?
Lane 2
Expected spacing
Committee survey – 2014-1018
Spacing (m/veh)
Speed (km/h)
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Hume Highway on-ramp queue
Before reaching this queue?
Every 12.4 seconds
S Western Motorway
S Western Motorway
Georges River
Powerhouse Road
Lakewood Cres
Phoenix Cres
Motocross Madness

The NSW Government has developed a very detailed model of this area

industry sources claim well over $½ million of taxpayers money was spent on developing this model

The earlier NSW Government Independent Reviewer recommended that

two community representatives be on that committee overseeing the traffic modelling

At that time, two different community organisations independently approached me to represent them on such panel

I have agreed to both requests

Nothing eventuated

Summary

The truck size – and – spacing between vehicles – are – operational constraints

Not affected by TEU numbers

Grid-locked – Hume Highway – and – other surround roads – are – environmental constraints

Not affected by TWU numbers

Increasing the TEU limit – impacts

- Right-hand turns – onto the Hume Highway
    - Intersection capacity constraint: 20% – cannot make that movement + stop rate 1.4
    - Impacts: queue lengths – increase spilling back further – onto the M5

      That will reduce – the distance – available lane-changing

- Frequency of tracks lane-changing – in the (greatly) reduced distance

As I leave you with those thoughts

I hope – that you share my concerns

We already have a crash rate – that is – 40 times higher – than the RMS Guidelines

And 85% – of the Moorebank Intermodal traffic – <u>will use this black spot</u> – see Page 50

How many lane-changing trucks?

For 500,000 TUEs

Simple back of the envelope calculation:

Take TfNSW: 5,175 daily truck movements
Apply Average correction factor: 4 * 5,174 = 20,700 daily truck movements

Assume even distribution throughout the day:

- Trucks per hour: 20,700 trucks / 24 hours = 862.5 trucks per hour
- Trucks per minute: 862.6 trucks / 60 mins = 14.4 trucks per minute
- Alternatively: 4.2 **seconds between trucks**
  - 8.4 seconds between trucks in one direction, and
    8.4 seconds between trucks in the other direction

Use SIMTA + MICLE EIS to calculate trucks changing lanes

About 65% of the trucks change lanes
This translates to a truck every 6.2 seconds
That is 12.4 seconds between trucks in one direction , and
12.4 seconds between trucks in the other direction

Page 32 shows its implementation – and its restrictions

Summary

- On Page 1 – Ms Melany Gibbons, MP has difficulties obtaining the latest traffic count data
- On Page 9 – SIMTA EIS 3 uses a different crash investigation area -- (stop crash comparisons?)
- On Pages 19 and 21 – All the intersections are modelled as isolated intersection -- (to convey "better" results?)
- On Page 27 – the modellers generate truck numbers as low as possible
- On Page 28 – TfNSW states that SIMTA should use truck numbers that are 10 times higher
  This recommendation was not required in any other EIS that followed it
- On Page 30 – check Enfield EIS volume – why would this be a low number?

This page was intentionally left blank

Answers to possible questions

Page 40 shows a Flow – Density relationship – this is one of the **Fundamental diagrams**
Think about "**rules**" in mathematics – or "*laws*" in physics
it is "**Fundamental Diagrams"** in traffic engineering

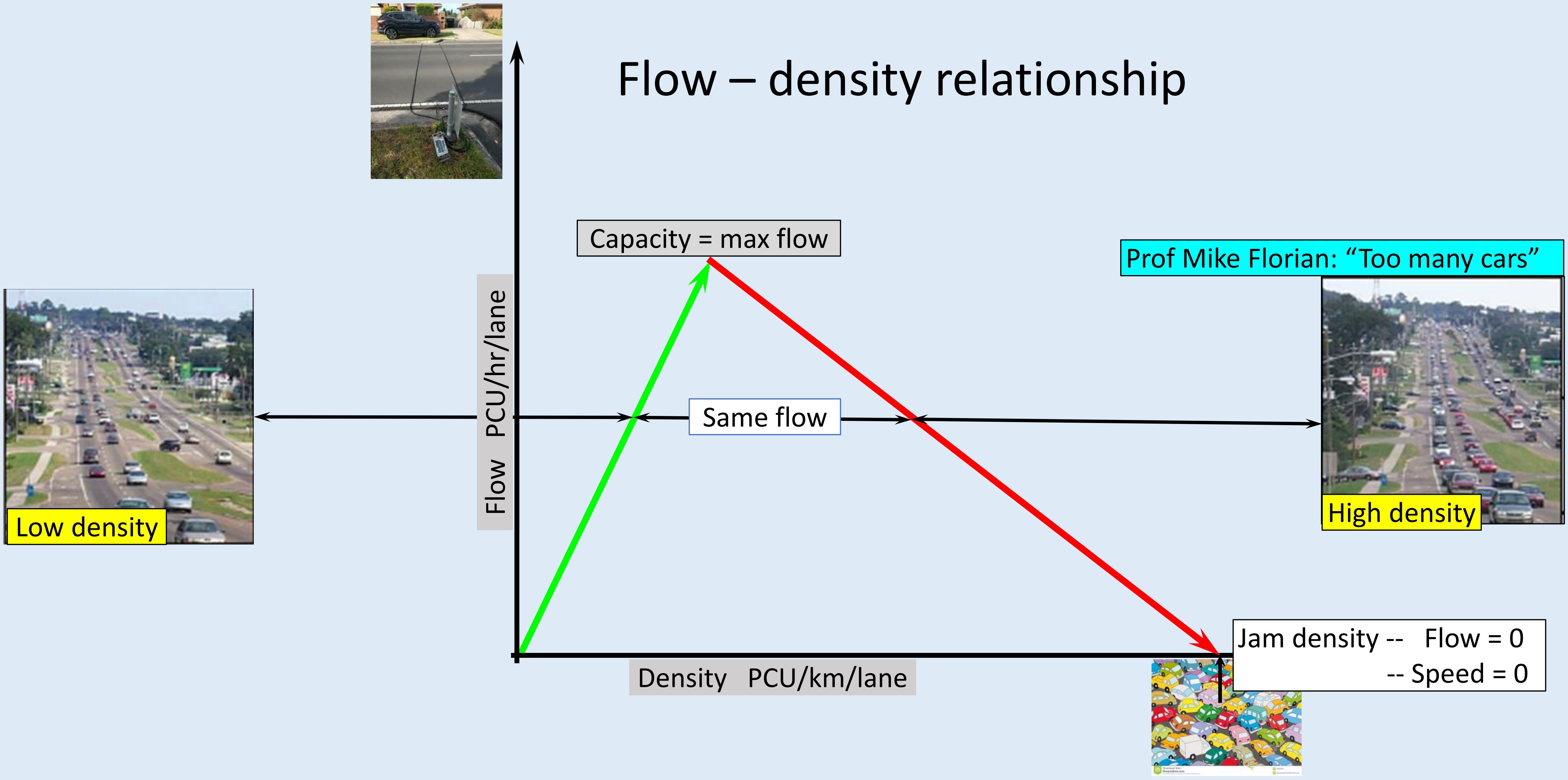
- on the Y-axis – the traffic flow – typically measures using those black tubes
- on the X axis – number of vehicles (use "density" or "occupancy")

On the right hand side
a cartoon to indicate Jam density – vehicles bumper to bumper – absolute limit
first vehicle can move – but no one else – therefore, flow is zero.

On the green line – if there no vehicles on the roadway – flow = zero
Add more vehicles flow increases – until capacity is reached (critical spacing Page 24)

If more vehicles are added – follow the red line – keep adding vehicles to the road until jam density is reached

Note: the measure of traffic flow is ambiguous – "flow on the green line" or "flow on the red line"
If the flow is on the red line – think of: screech – thump – tinkle, tinkle, tinkle


Flow – density relationship
Capacity = max flow
Prof Mike Florian: “Too many cars”
Flow PCU/hr/lane
Same flow
Low density
High density
Jam density -- Flow = 0
-- Speed = 0
Density PCU/km/lane

Page 42 shows the relationship between vehicle spacing, speed, flow and density

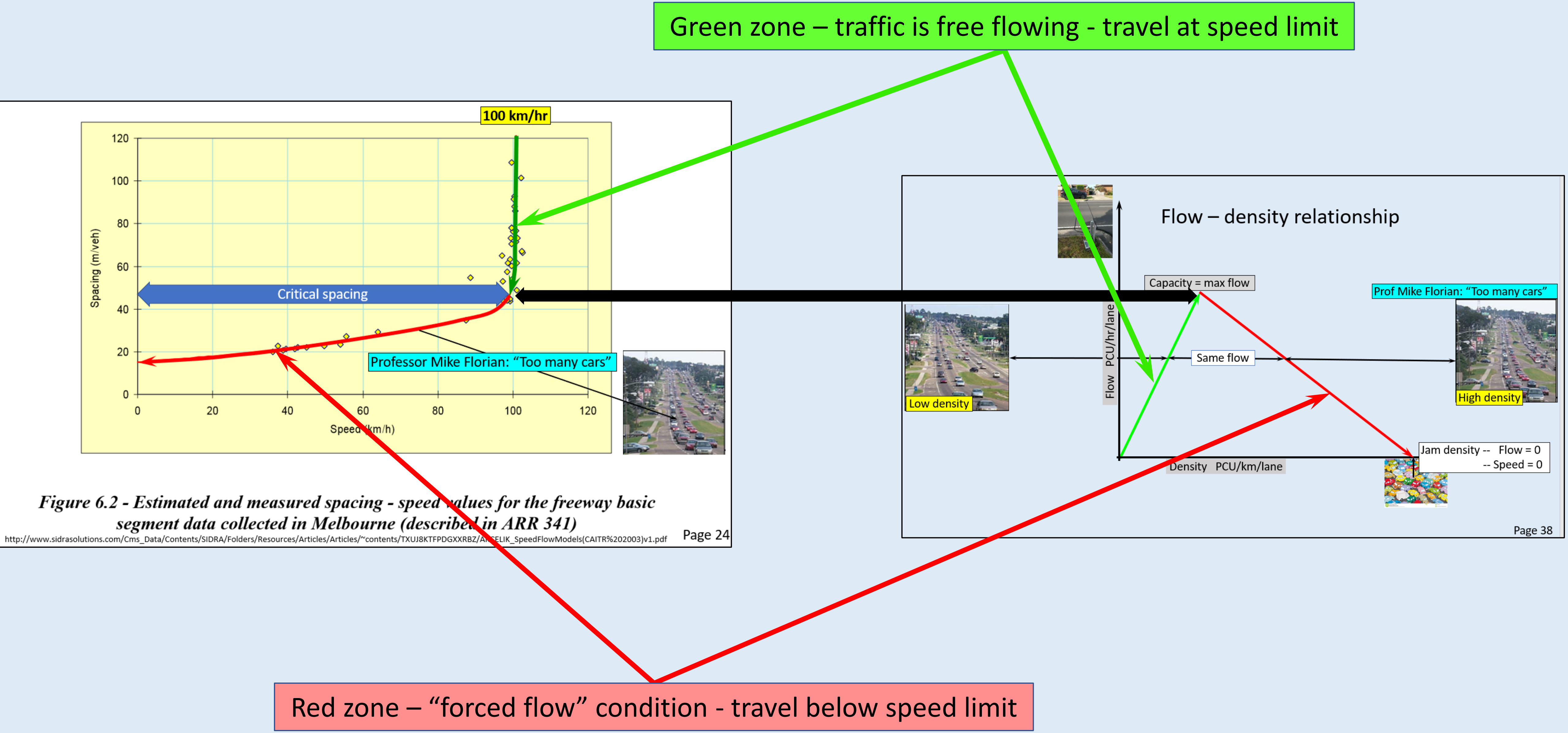
As long as we operate on the green line – everything is sweet.

If we operate on the red line

then it is a matter of “how far down” on the red line

see images with “too many cars”

Critical spacing = maximum flow



After PAC 2 – several people approached me about helping gather data for my own modelling

Page 42 -- I was interested in the average speed over the M5 Bridge for Lane 1 and Lane 2
But only over the section over the water

For obvious reasons not so many data point for Lane 2
Something is better than nothing

Lane 4
Lane 3
Lane 2
Lane 1
Naming convention
Liverpool Mazda
Liverpool Regional Museum
Reilly St
Domino's Pizza Liverpool
Georges River
Moorebank Ave
Manheim
Heathcote Rd
Ernie Smith Reserve
Moorebank Liverpool District Hockey Club
Junction Rd
S Western Motorway
McDonald's Casula
ABB Australia
Nulon
Anzac Rd
Jardine Park
Coles Express

Page 46 shows the results of the Community survey

The results are plotted on the Spacing – Speed diagram

And also on the Flow-density fundamental diagram

From the flow-density curve a quick back of the envelope calculation:

If we were to double the lanes (and half the density) we would still be on the red line

We also know from the equilibrium theory that

The network is so congested – that

If the network was improved here

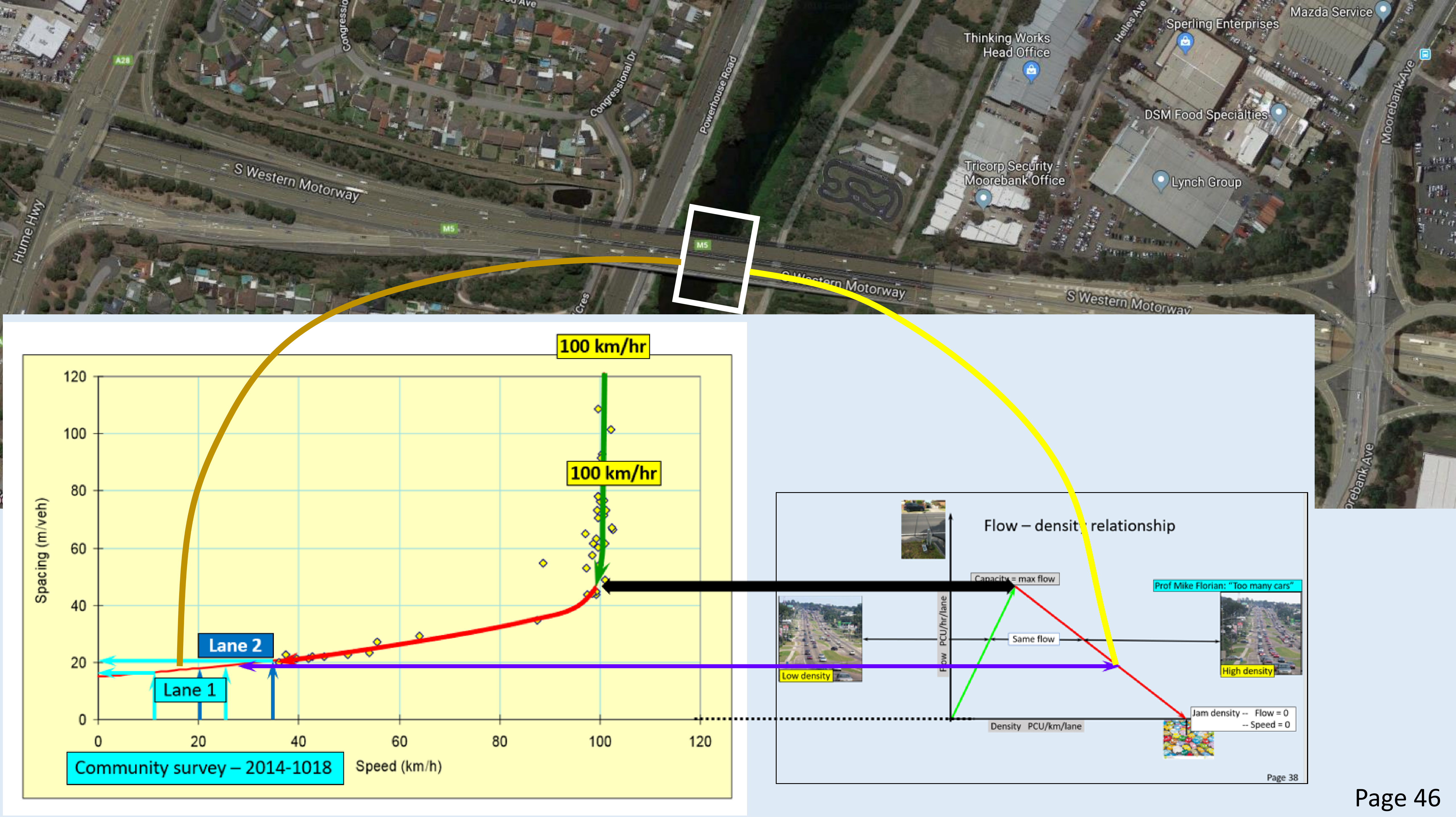
It would attract more traffic – and some of the improvement will therefore disappear

In a meeting with the TfNSW the most senior consultant to the Government:

"We can land people on moon – we can solve Moorebank"

If the Governments have enough money to land a person on the moon,

Should we really be spending all that money on solving Moorebank?

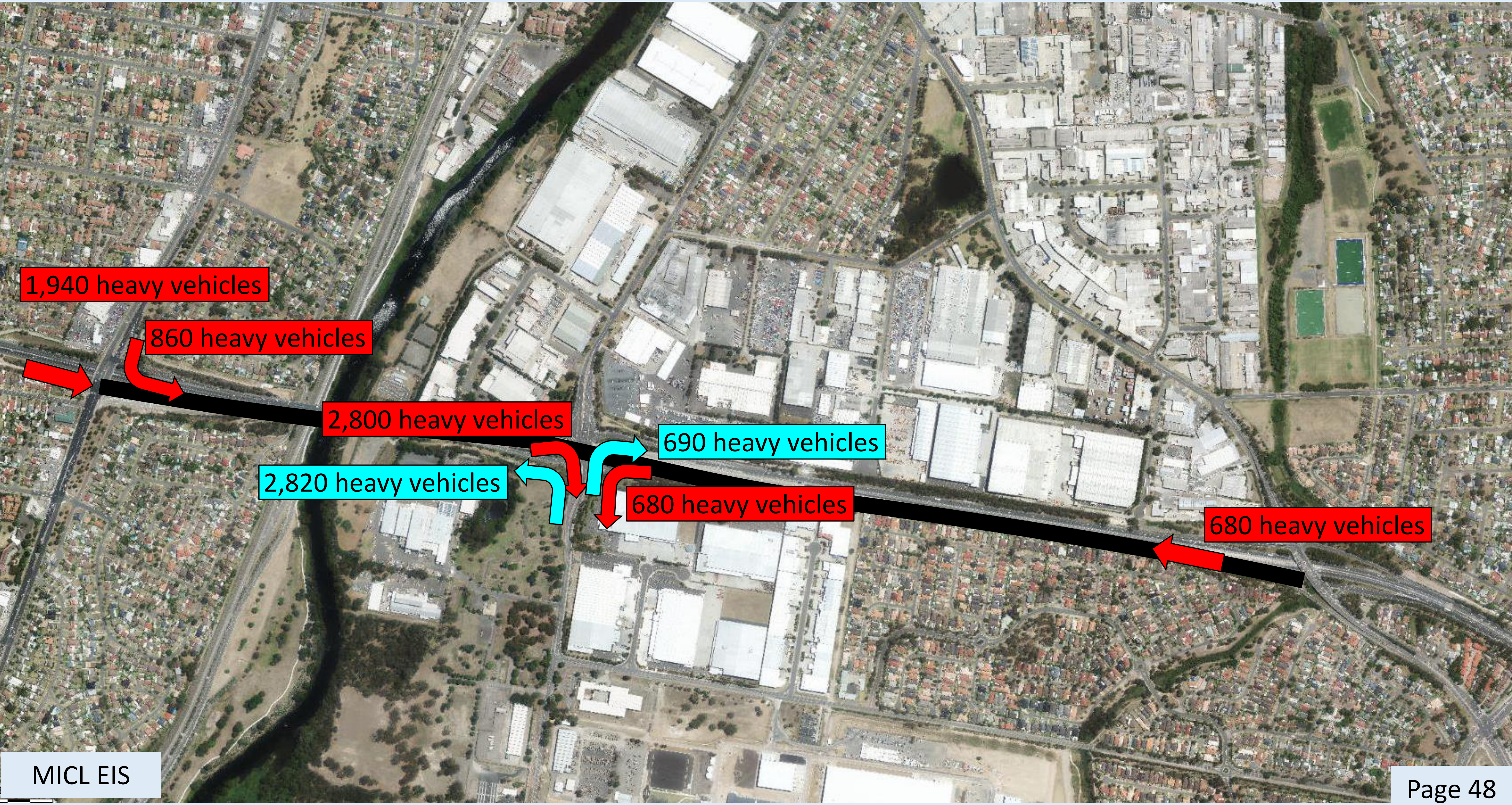


S Western Motorway
Hume Hwy
Powerhouse Road
Congressional Dr
Thinking Works Head Office
Sperling Enterprises
Mazda Service
DSM Food Specialties
Tricorp Security - Moorebank Office
Lynch Group
Moorebank Ave
Helles Ave
M5
A28
100 km/hr
100 km/hr
Spacing (m/veh)
Speed (km/h)
Lane 2
Lane 1
Community survey – 2014-1018
Flow – density relationship
Capacity = max flow
Prof Mike Florian: "Too many cars"
Same flow
Low density
High density
Flow PCU/hr/lane
Density PCU/km/lane
Jam density -- Flow = 0
-- Speed = 0
Page 38

Page 48 shows actual daily truck numbers from MICL EIS

See Pages 27 and 28 for TfNSW comment on SIMTA EIS modelling

TfNSW have not enforced its own recommendation


1,940 heavy vehicles
860 heavy vehicles
2,800 heavy vehicles
690 heavy vehicles
2,820 heavy vehicles
680 heavy vehicles
680 heavy vehicles

The SIMTA EIS 1 and MICL EIS use slightly different assumptions about the paths for their trucks

Page 48 shows the general order of magnitude of the expected movements

Note SIMTA has a portion that travels to Newbridge Rd
MICL's trucks only travel as far as the Goodman warehousing on Moorebank Av


For simplified traffic flows in one direction only
Intermodal traffic about 25%-27%
Intermodal traffic about - 55% - 60%
Intermodal traffic about - 25% - 27%
Intermodal trucks 80% - 85%
M5 – Hume Highway traffic
SIMTA has traffic going to Newbridge Rd
S Western Motorway
Georges River
Hume Hwy
Moorebank Ave
Powerhouse Road
NSW Barefoot Water Ski Club
Thinking Works Head Office
Tricorp Security - Moorebank Office
Lynch Group
DSM Food Specialties
Sperling Enterprises
Helles Park Takeaway
NSWRCRCC
Flat Glass Industries Limited
ABB Australia
Mayo Hardware
Early Learning Centre
Liverpool Volkswagen
McGrath Holden Liverpool
ibis budget Casula Liverpool
McDonald's Casula
Little Caesars Pizza
Foot Focus
The Fontainebleau Motor Inn
Khodal Hair Design & Beauty Salon
Family Medical Practice
Google

Congested network

Only one University in Australia teaches transport modelling at post-graduate level

Few other places teach traffic engineering

Knowing some of the academics personally,
- I need to be convinced that Australia generates good traffic engineers and modellers

As far as I can gather only uncongested traffic flows (on the Green Line) is taught

Here we deal with flows on the Red line
– most academics do not venture out into this territory – hence this is controversial

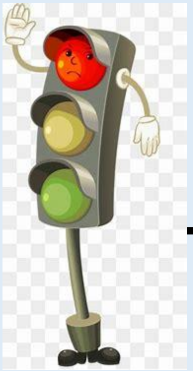
- Traffic lights generate platoons
  - the lengths are determined by the green time of the signalised intersection

Page 52 – At some distance away from the traffic signals, platoons travel at speed limit + gaps between platoons (yellow time)
- By definition – roadway has "available capacity" – we are on the green line

This is true – if – and only if – we are looking at a short section of a single roadway

Congested network

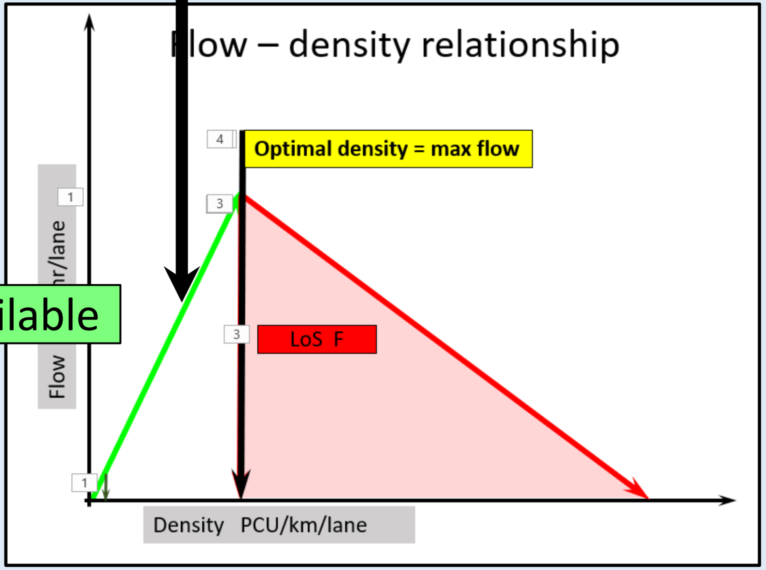
Link capacity in congested a network

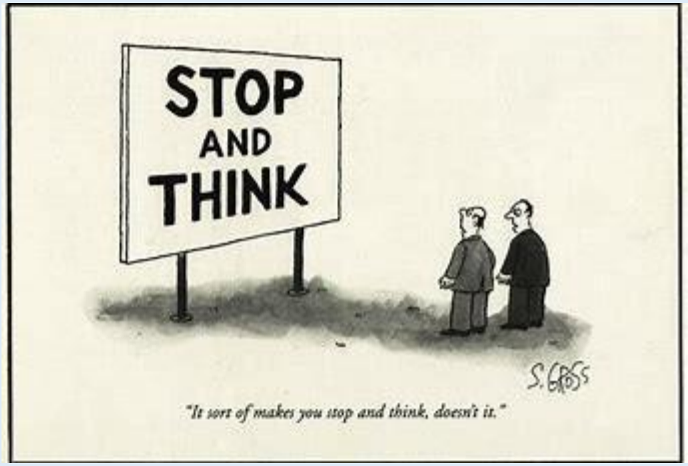


Traffic lights - generates platoons

Vehicles are a long way from signals -- travel at speed limit = Green Zone

Big gaps = capacity available





True – IF – and only IF – one isolated link is considered

To keep things simple – imagine a simple T intersection

traffic flows only in one direction

The slave intersections

slices the traffic into the “right” platoon sizes – using their “green” times

At the major intersection

The approaching platoons are zippered into one continuous platoon

See Page 54 - So far, so good

However

down the road, there is another major intersection

It has to stop the continuous platoon

To make way for its through traffic and right-hand turning vehicles

When the continuous platoon is stopped

- when the lights go green – the first car ca move – then the second car etc.

the last car can move only when it is safe to do so

Meanwhile

The coordinated traffic signals will have turned the main intersection signals to green

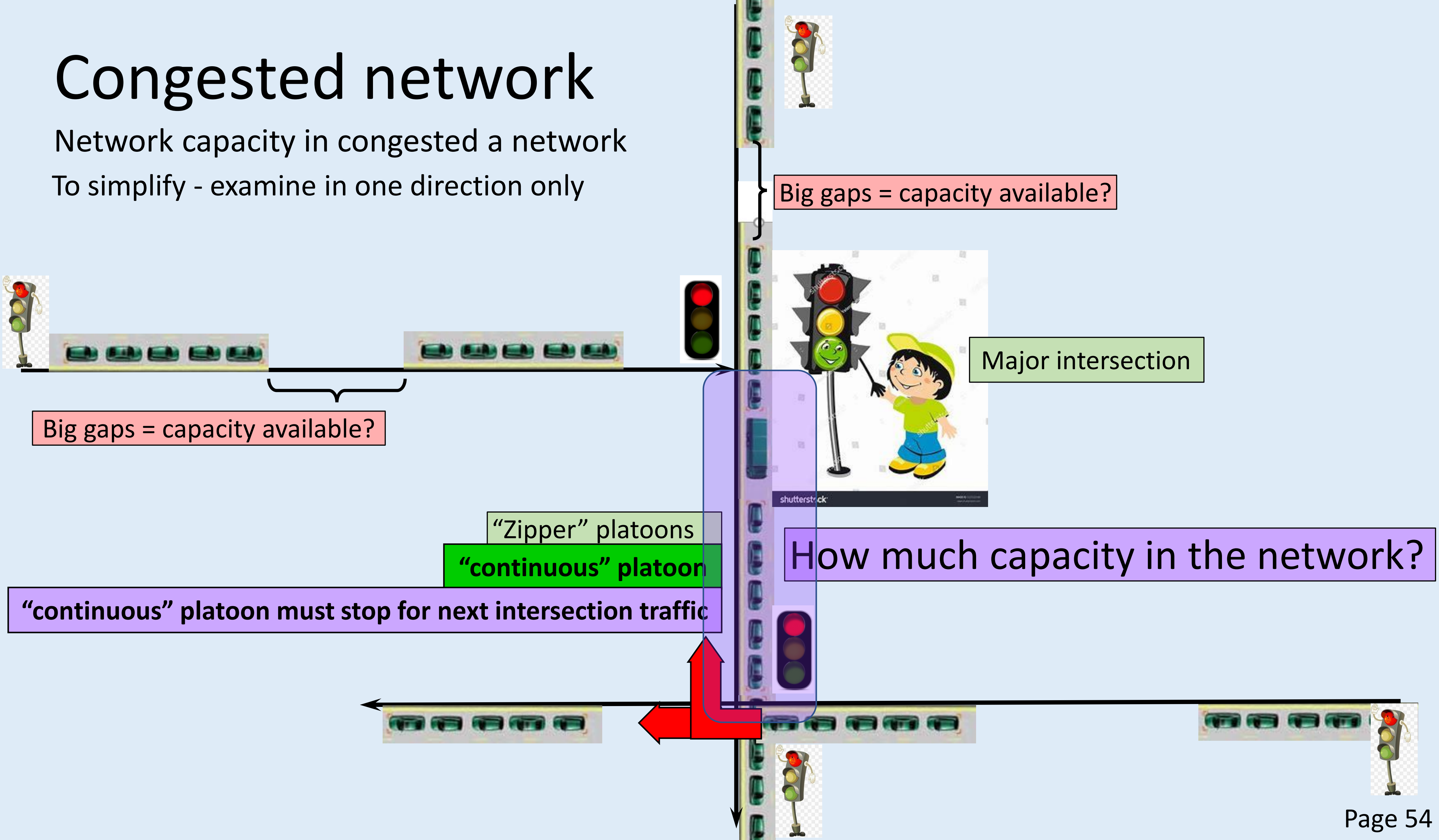
and more vehicles are added to the tail end – which is still waiting to move

How do we calculate the capacity of the system?

Congested network

Network capacity in congested a network

To simplify - examine in one direction only



An overview of Queueing Theory

Two input variables: arrival rate and service rate
For simplicity: either could be “random” or “constant”

Page 56 - when we go to Woollies or Coles

Yellow box – random arrival rate – at the check out: random service rate

Brown arrow points to a curve from a text book

- On the Y-axis delays (or queue length or many other queueing attributes)
- On the X-axis traffic intensity – thick of arrivals (the more arrivals the longer the delay, queue lengths etc.)

Green box - a factory: constant arrival rate and constant service rate

Green arrow points to the “brick wall” shape

if the packing machine capacity is 100 units per hour – any number up to 100 is perfectly OK

Any number higher than 100 creates a mess in the factory

There is no warning between 100 and 101 – just the mess in the factory

Queueing theory

Arrivals – random or constant
Service – random or constant
Four possible cases

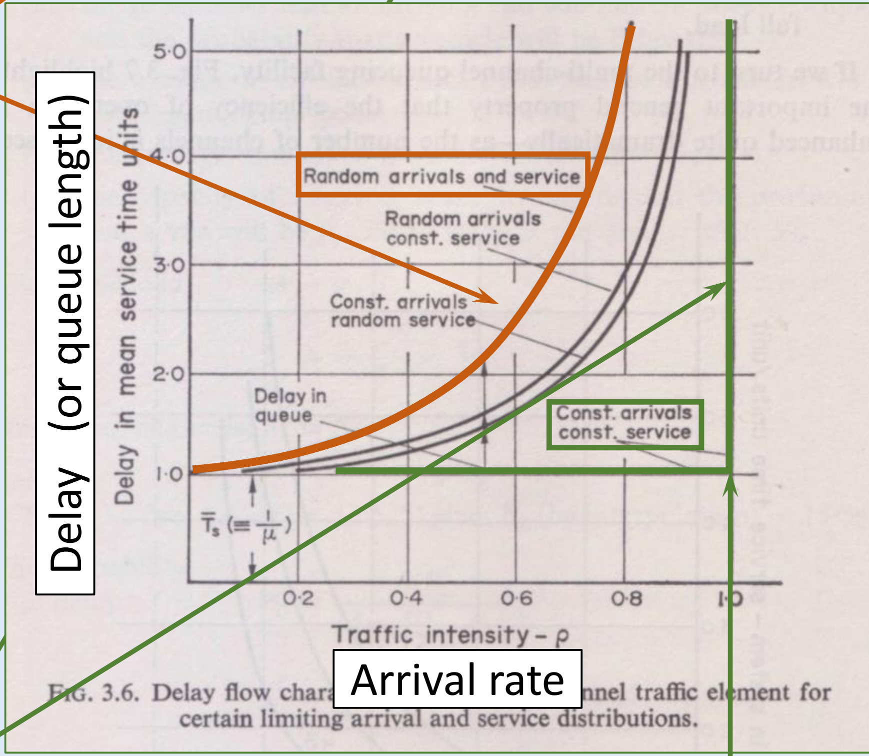
Random arrival rate

This Photo by Unknown Author is licensed under CC BY-ND

This Photo by Unknown Author is licensed under CC BY-SA

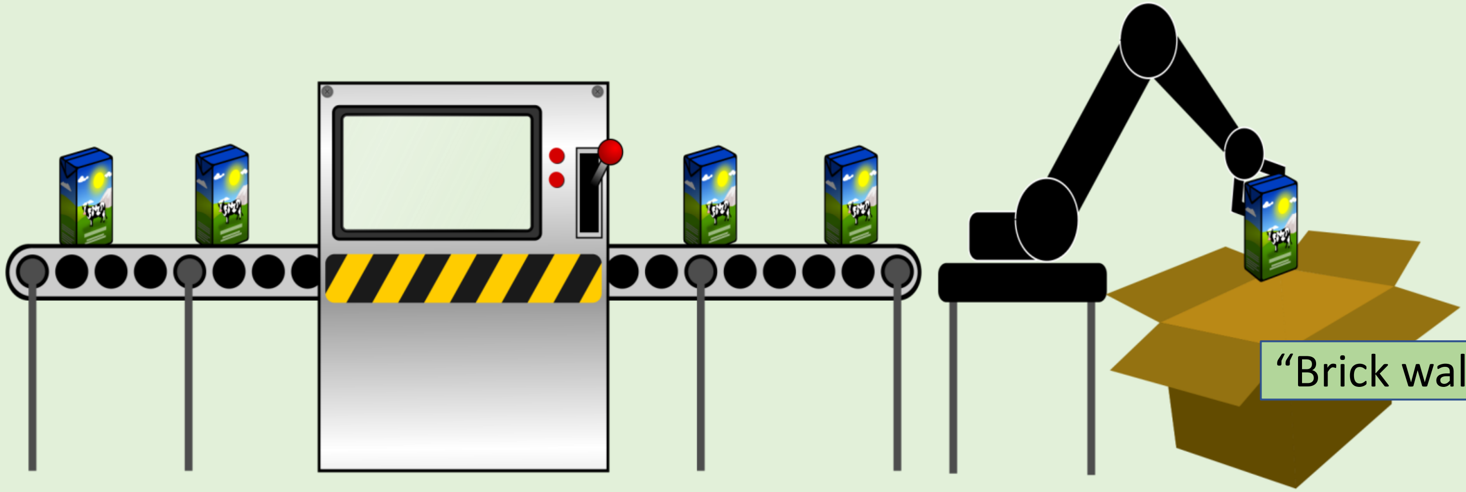
Random service rate

This Photo by Unknown Author is licensed under CC BY-NC-ND



Constant arrival rate

Constant service rate



"Brick wall" curve – no warning before capacity is reached

Apply queueing theory to traffic engineering

When the traffic flow is low

arrival rate is random

Traffic lights: “constant” service rate

See brown arrow to Brown curve

When traffic flow is high

arrival rate of platoons is constant

Traffic lights: “constant” service rate

See green arrow to Green curve (brick wall curve)

When

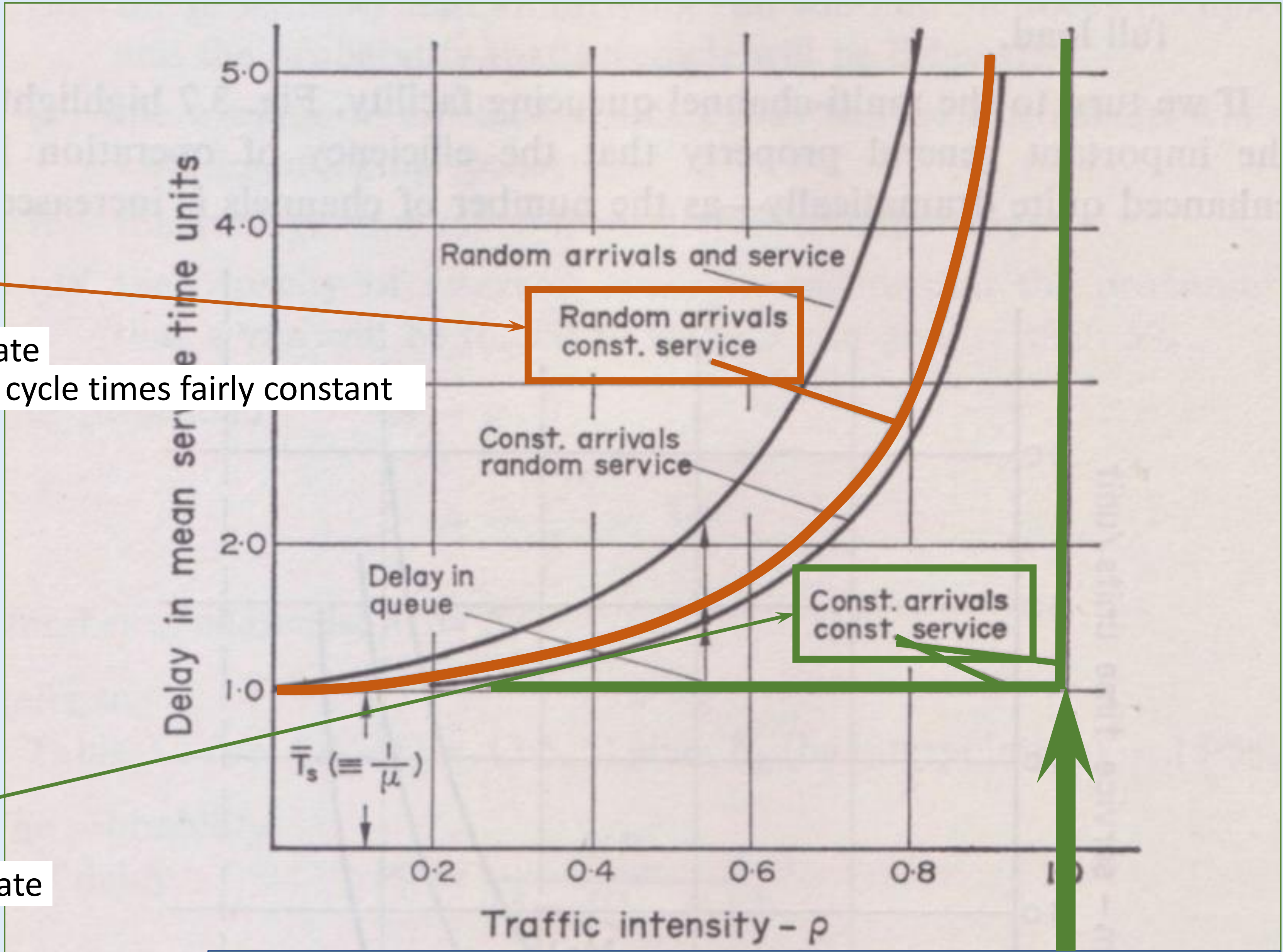
- queue lengths are longer than the distance between the intersections, and
- volume / capacity is greater than 1.0

We can strongly suspect that the capacity of the system capacity has been exceeded – probably by a significant margin

Random arrival rate

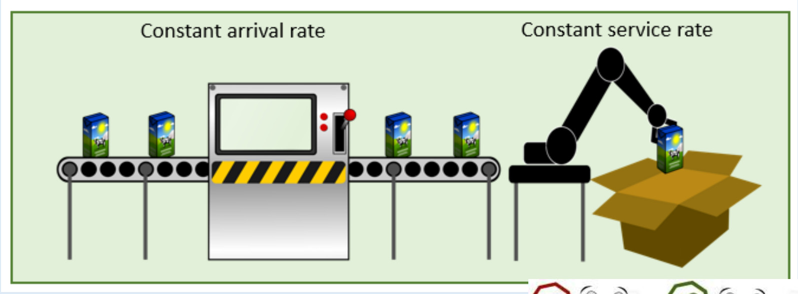
Constant service rate

Green-Yellow-Red cycle times fairly constant



"Brick wall" curve – no warning before **network** capacity is reached

FIG. 3.6. Delay flow characteristics of single-channel traffic element for certain limiting arrival and service distributions.



Constant arrival rate

Constant service rate

Page 60 shows another complex diagram

The green and Red curves – form the Speed-Flow relationship – another fundamental diagram

- On the Y-axis: speed
- On the Axis: traffic flow

Maximum flow corresponds to where the green curve changes to the red curve

We also know that when traffic volumes are on the red line – we may end up with the network gridlock.

From a planning point of view, we need a tool that pin – point future network issues.
In that tool, we use the Brown curve – it allows flows to be greater than the maximum – see brown box

Now we do a simple volume / capacity calculation – all the links that have values greater 1.0 are the problem area.

Traffic engineers know that the volume on the brown curve cannot exist – see the black box

In more than 30-years working as an independent transport modeller,
For the Benefit- Cost calculations,
I always had to supply traffic volumes from the Brown curve – never from the Red curve

If volumes are higher than capacity – then there will be difficulties with intersection modelling

Fundamental diagram: – Speed-Flow relationship (strategic models)

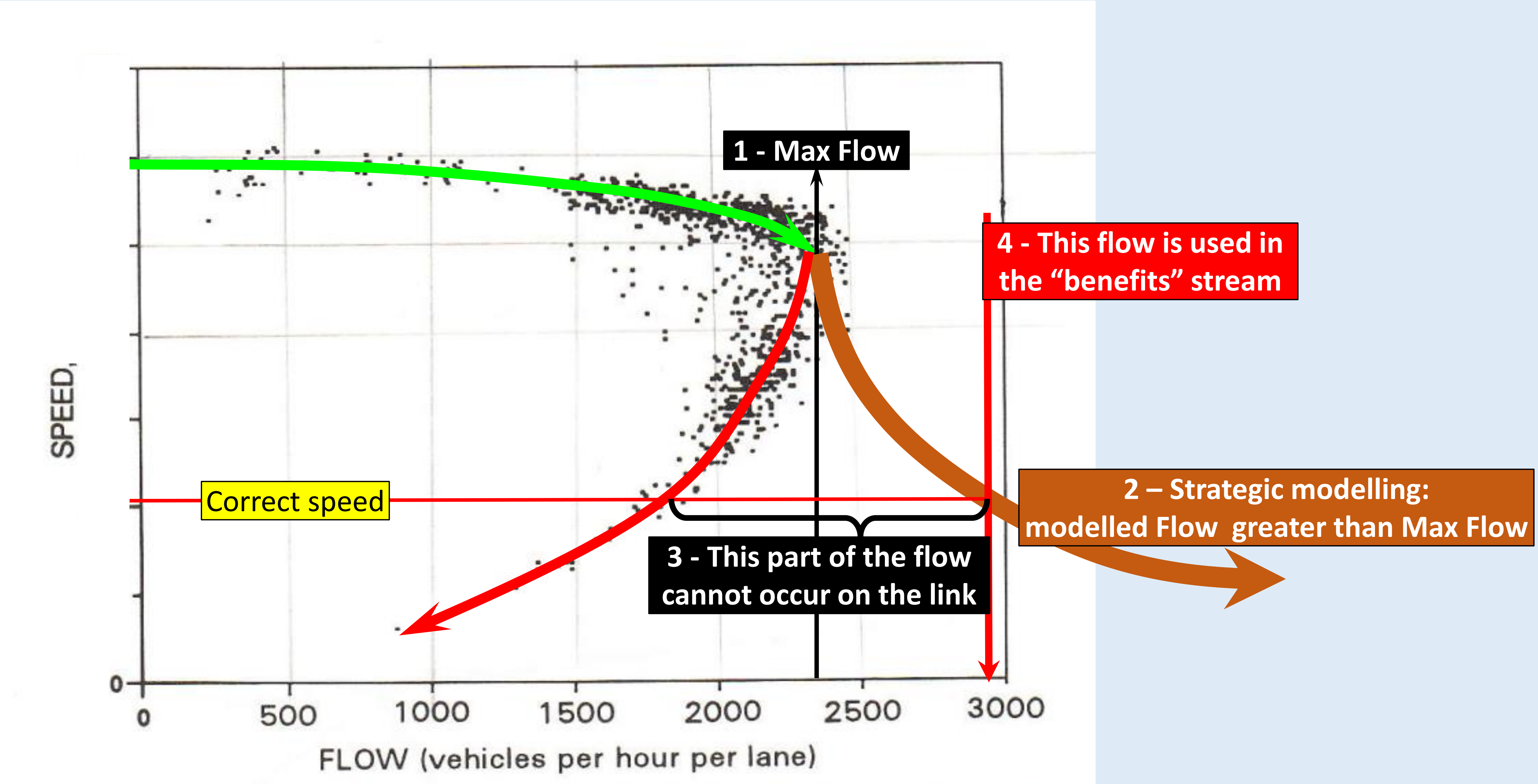


Figure 2-21. Observed speed-flow relationship on a San Diego

Page 62 show the expected queue length from the Industry Park Access on Moorebank Av plotted on a Google map. This is the Base AM – no Moorebank Intermodal traffic

The queue length is much longer that the distance between the intersections

As before, in the other examples, this existing queue is ignored when the Moorebank Av – M5 intersection was modelled

The Parsons Brinckerhoff modelling outputs shows another issue – relating to this Industry Park Access intersection

The purple box – there is a number highlighted in Yellow + a Red annotation!!!

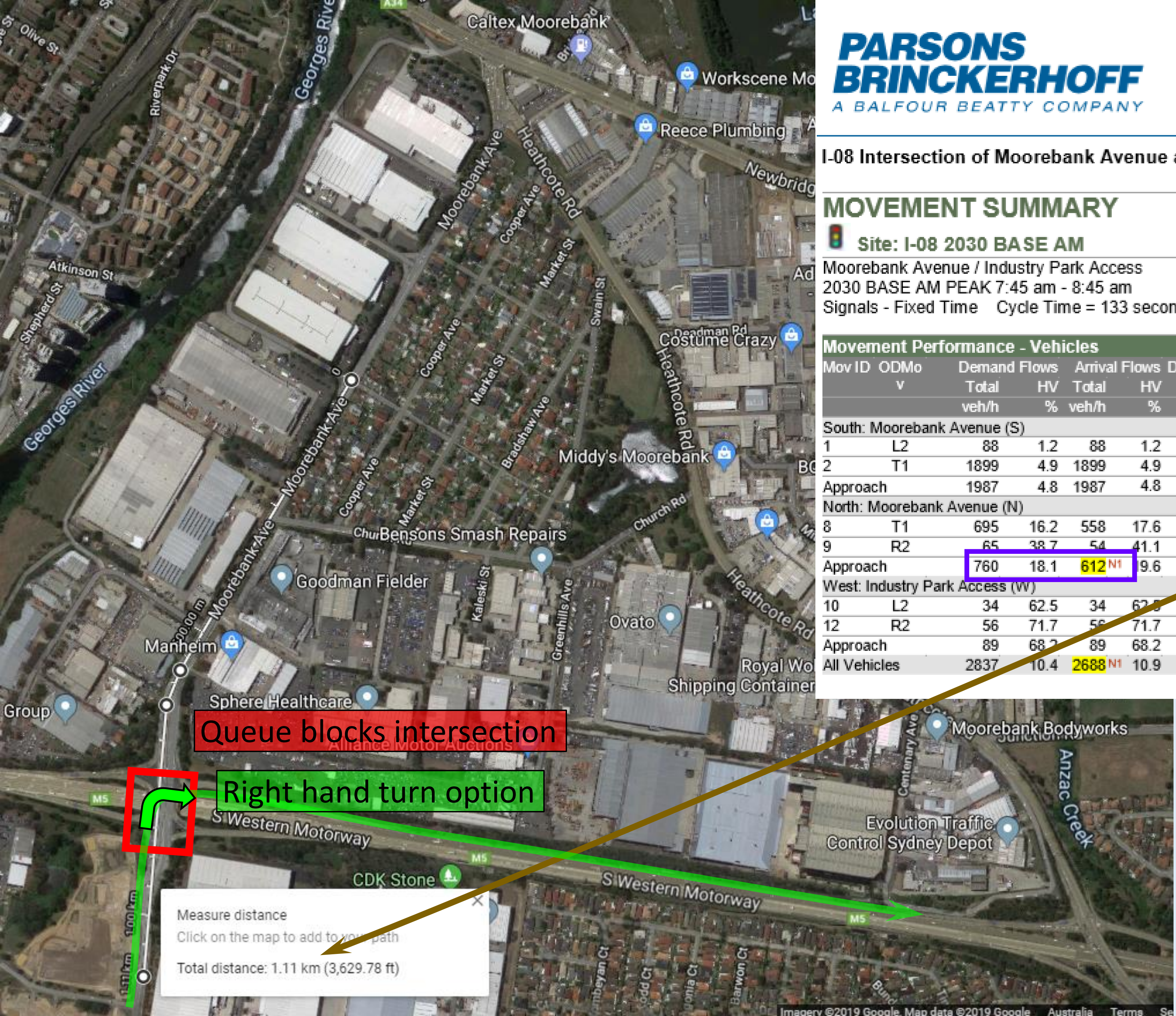
Not all of the demand travelling southbound (810) can travel through this intersection

In fact, only 635 vehicles can travel through this intersections

Where in the network will this difference in car numbers be stored (over 1km of bumper-to-bumper vehicles?)

- not all the vehicles can get through the intersection
- queue lengths are longer than the distance between intersections

What does this say about the network capacity?



PARSONS BRINCKERHOFF
A BALFOUR BEATTY COMPANY

I-08 Intersection of Moorebank Avenue and Industry Park Access

MOVEMENT SUMMARY

Site: I-08 2030 BASE AM **Network: 2030 BASE AM**

Moorebank Avenue / Industry Park Access
2030 BASE AM PEAK 7:45 am - 8:45 am
Signals - Fixed Time Cycle Time = 133 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)													
1	L2	88	1.2	88	1.2	0.053	6.1	LOS A	0.4	2.8	0.12	0.58	43.1
2	T1	1899	4.9	1899	4.9	1.215	256.5	LOS F	156.8	1144.3	1.00	2.09	6.2
Approach		1987	4.8	1987	4.8	1.215	245.3	LOS F	156.8	1144.3	0.96	2.02	6.6
North: Moorebank Avenue (N)													
8	T1	695	16.2	558	17.6	0.193	2.5	LOS A	3.6	29.1	0.22	0.19	56.9
9	R2	65	38.7	54	41.1	1.017	115.3	LOS F	4.7	44.9	1.00	1.06	11.5
Approach		760	18.1	612 N1	19.6	1.017	12.7	LOS A	4.7	44.9	0.29	0.27	45.9
West: Industry Park Access (W)													
10	L2	34	62.5	34	62.5	0.415	64.9	LOS E	2.3	24.3	0.95	0.73	9.6
12	R2	56	71.7	56	71.7	0.392	67.8	LOS E	2.6	29.5	0.98	0.73	19.9
Approach		89	68.2	89	68.2	0.415	66.7	LOS E	2.6	29.5	0.97	0.73	16.7
All Vehicles		2837	10.4	2688 N1	10.9	1.215	186.5	LOS F	156.8	1144.3	0.81	1.58	9.1

It is easy to calculate the number of vehicles who wanted to get through the intersection - but could not

The yellow line represents those vehicles who could not get through the intersection

The MICL EIS modelling it takes 14 minutes 5.2 seconds to make this right hand turn

Trust me when I say that the according to the MICL EIS modelling, the rest of the network is also congested

If you do not believe me, please ask Ms Melany Gibbons MP,
I gave a 1-hour presentation to her in which I outlined some of the bigger traffic issues in Liverpool

She may even remind you, that according to the MICLE EIS modelling,
it would be quicker for her to ride push bike for the last leg of he journey to work trip

Vehicles tagged with yellow highlight that could not get through – displayed as bumper-to-bumper length

PARSONS BRINCKERHOFF
A BALFOUR BEATTY COMPANY

Appendix H - 2030 SIDRA Results with and without Moorebank IMT

I-09 Intersection of Moorebank Avenue and Church Road

MOVEMENT SUMMARY

Site: I-09 2030 BASE AM

Moorebank Avenue / Church Road
2030 BASE AM PEAK 7:45 am - 8:45 am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMo	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
2	T1	2101	6.4	0.737	4.3	LOS A	11.1	82.6	0.18	0.11	55.5
3	R2	282	7.8	0.737	25.5	LOS B	11.1	82.6	1.00	0.60	40.4
Approach		2383	6.6	0.921	6.8	NA	11.1	82.6	0.28	0.17	53.1
East: Church Road (E)											
4	L2	200	14.2	0.243	7.1	LOS A	1.0	7.6	0.48	0.70	47.6
6	R2	7	0.0	0.945	845.2	LOS F	2.5	17.2	1.00	1.07	4.0
Approach		207	13.7	0.945	36.9	LOS C	2.5	17.2	0.50	0.71	34.2
North: Moorebank Avenue (N)											
7	L2	37	0.0	0.219	5.6	LOS A	0.0	0.0	0.00	0.06	57.7
8	T1	717	21.1	0.219	0.0	LOS A	0.0	0.0	0.00	0.03	59.6
Approach		754	20.1	0.219	0.3	NA	0.0	0.0	0.00	0.03	59.5
All Vehicles		3344	10.1	0.945	7.2	NA	11.1	82.6	0.23	0.17	52.5

Here two Paramics snapshots near the location of the network of the AM peak network.
These Paramics images comes from the SIMTA EIS 1.
These images show the world, why the modellers want the network to be "… investigated thoroughly"

On the right hand side – detailed image on their modelled results:
Note the spacing of the vehicles, and where the images have been trimmed

On the left hand side – the congested road network:

- the green arrow shows that on average, a motorist will take more than 200 seconds to travel straight ahead
- The red right-hand-turn arrow shows that on average, a motorist will take more than 300 seconds to make that right hand turn (more than 5 minutes for this intersection alone (ref: SIMTA EIS 1)

Far more telling, is the comment from SIMTA's model auditors – see reference blow:

- There is no mentioning of background traffic growth.
    - ➢ *It is unclear whether this is due to existing capacity constraints under current road conditions?*

Appendix G Paramics (Traffic) Model Audit Report by Halcrow, Page 14


More than 200 secs
More than 300 secs
Paramics snapshot
Note: spacing
M5
Moorebank Ave
Paramics snapshot
M5 on-ramp
Note: spacing
S Western Motorway
Georges River
Early Learning Centre
Boundary Rd
Liverpool Volkswagen
McGrath Holden
Grove St
ibis budget Casula Liverpool
Hume
McDonald's Casula
Little Caesars Pizza
Graham Ave
BP
Foot Focus
The Fontainebleau Motor Inn
Khodal Hair Design & Beauty Salon
Family Medical Practice
Phoenix Cres
Deerwood Ave
Powerhouse Road
Goodman Fielder
Manheim
Mayo Hardware
Google