



QA of Transport for NSW's 2018-19 pricing proposal for compliance with IPART Determination

THE INDEPENDENT PRICING AND REGULATORY TRIBUNAL OF
NSW (IPART)

June 2018

QA of Transport for NSW's 2018-19 pricing proposal for compliance with IPART Determination

Executive summary	iv
1 Introduction	1
2 Replication of TfNSW's Average Adult Fares	3
3 Testing whether the 2017-18 sample period is reasonable	9
4 Testing the impact of the Opal Day Pass trial	16
5 Sensitivity analysis of the use of contactless payments	18

QA of Transport for NSW's 2018-19 pricing proposal for compliance with IPART Determination

Boxes

Box 1: Summary of Frontier Economics' key findings	iv
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Figures

Figure 1: 'Trip Distribution' – Opal reloadable (Adult)	10
Figure 2: 'Trip Distribution' – Opal reloadable (Concession)	11
Figure 3: 'Trip Distribution' – Single Trip Tickets (Adult)	12
Figure 4: 'Trip Distribution' – Single Trip Tickets (Concession)	13

Tables

Table 1: Average Adult Fare by Product	3
Table 2: Frontier Economics' replication of TfNSW's observed Opal card Trip Distribution and Average Adult fare for 2017-18	5
Table 3: Frontier Economics' replication of TfNSW's projected Opal card Trip Distribution and Average Adult fare for 2018-19	6
Table 4: Frontier Economics' replication of TfNSW's observed Single Trip Ticket Distribution and Average Adult fare for 2017-18	7
Table 5: Frontier Economics' replication of TfNSW's proposed Single Trip Ticket Distribution and Average Adult fare for 2018-19	8
Table 6: Frontier Economics' testing of alternative Trip Distributions - Opal reloadable	14
Table 7: Frontier Economics' testing of alternative Trip Distributions - Single Trip Tickets	15
Table 8: Frontier Economics' sensitivity analysis of Opal Day Pass trial on the projected 2018-19 Single Trip Ticket Trip Distribution	17
Table 9: Frontier Economics' sensitivity analysis of contactless payments on the projected 2018-19 Single Ticket Trip Distribution	20

Executive summary

On 20 May 2016, The Independent Pricing and Regulatory Tribunal of NSW (IPART) determined the maximum fares to apply from July 2016 to June 2019 for all Opal Sydney services in Sydney and surrounds (covering rail, light rail, buses and ferries). IPART's Determination was issued in the form of a maximum weighted average price change. On average, Adult Opal fares can increase by a maximum of 13% (including inflation) over the 3 years to June 2019.

Frontier Economics was engaged by IPART to undertake a Quality Assurance (QA) check of TfNSW's 2018-19 pricing proposal and provide assurance that the data and calculations used can be extracted and replicated to give average fares that that comply with IPART's *Transport – maximum fares for Opal services*.

A summary of our key findings is set out in Box 1.

Box 1: Summary of Frontier Economics' key findings

We have reviewed the logic, calculations and assumptions underlying the pricing proposal and are satisfied that the Average Adult Fare for 2018-19 in the TfNSW Pricing Proposal have been calculated appropriately in that:

- Assumptions used in the calculation of the Trip Distribution can either be traced to source data or information reflecting the number of trips on Opal Services made for the representative 2017-18 period.
- These assumptions are documented, are reasonable and are correctly used to calculate weights in the Trip Distribution and this calculation.
- The Average Adult Fare is correctly calculated using this Trip Distribution and that this calculation can be replicated

On this basis we can provide assurance that the proposed increase in the Average Adult Opal fare does not exceed a 13% increase (from 2015-16) including inflation and that the TfNSW Pricing Proposal complies with IPART's Determination: *Transport – maximum fares for Opal services*.

1 Introduction

On 20 May 2016, The Independent Pricing and Regulatory Tribunal of NSW (IPART) determined the maximum fares to apply from July 2016 to June 2019 for all Opal Sydney services in Sydney and surrounds (covering rail, light rail, buses and ferries). IPART's Determination was issued in the form of a maximum weighted average price change. On average, Adult Opal fares can increase by a maximum of 13% (including inflation) over the 3 years to June 2019.

Frontier Economics was engaged by IPART to undertake a Quality Assurance (QA) check of TfNSW's 2018-19 pricing proposal and provide assurance that the data and calculations used can be extracted and replicated to give average fares that that comply with IPART's *Transport – maximum fares for Opal services*.

In its 2018-19 pricing proposal TfNSW has proposed to:

- increase all Opal fares and caps (with the exception of the Opal Pensioner/Senior gold card day cap which will remain at \$2.50) by CPI (2.2 per cent) from 2 July 2018; and
- introduce a new Opal product – Opal One Day Travel Pass (“Opal Day Pass”) at a price of:
 - \$19 Adult/\$9.50 Child without airport access and
 - \$33.30 Adult/\$22.30 Child with airport access.

We have reviewed the logic, calculations and assumptions underlying the TfNSW 2018-19 pricing proposal and are satisfied that the Average Adult Fare of \$2.61 for 2018-19 has been calculated appropriately.

- Following our on-site visit to TfNSW's offices on 4 June 2018, we can provide IPART with assurance that the data provided by TfNSW can be traced back to source data or information on TfNSW's database using SQL queries.
- Our replication of the proposed Average Adult Fare of \$2.61 is provided in Section 2. On the basis of our findings, we can provide IPART with the following assurance.
 - The 2018-19 Average Adult Fare of \$2.61 can be replication using source data provided by TfNSW¹ on the trips on Opal Services made during the seven week representative period in 2017-18 under an Opal Card and under a Ticket. The period chosen was 26 February 2018 to 15 April 2018, comprising both normal travel weeks and weeks impacted by public holidays.

¹ In the Excel file entitled 'frontier data extract update 3'.

- The assumptions that are made by TfNSW in calculating the proposed Trip Distribution for 2018-19 from the representative period in 2017-18 are documented and correctly used.
- Any assumptions in calculating the proposed Trip Distribution for 2018-19 from the representative period in 2017-18 are correctly used to calculate weights in the proposed Trip Distribution and that this calculation can be replicated.
- The Average Adult Fare is correctly calculated using this Trip Distribution and that this calculation can be replicated.
- The seven week representative period from 26 February 2018 to 15 April 2018 that TfNSW proposes to use as the starting point for the 2018-19 Trip Distribution is reasonable. Our sensitivity analysis of alternative representative periods is outlined in Section 3. On the basis of our findings, we can provide IPART with assurance that the Average Adult Fare would not be significantly different under the following alternative sample periods, all of which have a mix of holiday and normal weeks.
 - Alternative period 1: 17 April to 2 July (including Easter Monday, Anzac day and Queen's birthday)
 - Alternative period 2: 7 August to 9 October (including August bank holiday and Labour day)
 - Alternative period 3: 27 November to 12 Feb (including Christmas/New year's and Australia day)
 - Alternative period 4 (**representative period chosen by TfNSW**): 26 Feb to 15 April (including good Friday/Easter Monday)
- We can provide assurance that the Opal Day Pass trial will have an immaterial impact Trip Distribution in 2018-19 due to low projected numbers. This is shown in Section 16.
- We can provide assurance that contactless payments will have an immaterial impact Trip Distribution in 2018-19 due to low projected numbers. This is shown in Section 18.

On this basis we can provide assurance that the proposed increase in the Average Adult Opal fare does not exceed a 13% increase (from 2015-16) including inflation and that the TfNSW Pricing Proposal complies with IPART's Determination: *Transport – maximum fares for Opal services*.

2 Replication of TfNSW's Average Adult Fares

Frontier Economics has been able to replicate TfNSW's proposed Average Adult Fare of \$2.61 for 2018-19 as set out in Table 1. These figures have been calculated using source data provided by TfNSW² on the trips on Opal Services made during the seven week representative period in 2017-18 under an Opal Card and under a Ticket. The period chosen was 26 February 2018 to 15 April 2018, comprising both normal travel weeks and weeks impacted by public holidays. Table 1 below replicates the figures in Table 1 and Table 2 of TfNSW's pricing proposal.

Table 1: Average Adult Fare by Product

Product group	2017-18 Observed Values		2018-19 Projected Values	
	Trip weighting	Average adult fare	Trip weighting	Average adult fare
Opal card	98.4%	\$2.52	98.4%	\$2.58
Ticket	1.6%	\$4.35	1.6%	\$4.54
TOTAL	100.0%	\$2.55	100.0%	\$2.61

Source: Frontier Economics calculations using data provided by TfNSW

To calculate the Average Adult Fare set out in Table 1 above, a 'Trip Distribution' is required. The Trip Distribution reflects the number of trips taken for an Adult Fare or each price band, as a proportion of total Trips taken for that period. Frontier Economics has been able to replicate TfNSW's observed Trip Distribution for 2017-18 and proposed Opal card Trip Distribution for 2018-19 using the source data.

- The **observed** 2017-18 Trip Distributions and fares for **Opal reloadable card trips** is present in Table 2 below. This table replicates Table 3 of TfNSW's pricing proposal.
- The **projected** 2018-19 Trip Distributions and fares for **Opal reloadable card trips** is present in Table 3 below. This table replicates Table 4 of TfNSW's pricing proposal.
- The **observed** 2017-18 Trip Distributions and fares for **Single Trip Tickets** is present in Table 4 below. This table replicates Table 5 of TfNSW's pricing proposal.

² In the Excel file entitled 'frontier data extract update 3'.

- The **projected** 2018-19 Trip Distributions and fares for **Single Trip Tickets** is present in Table 5 below. This table replicates Table 6 of TfNSW's pricing proposal.

Table 2: Frontier Economics' replication of TfNSW's observed Opal card Trip Distribution and Average Adult fare for 2017-18

Fare Up To	Holiday			Normal			Total		
	Trip Distribution		Average Fare	Trip Distribution		Average Fare	Trip Distribution		Average Fare
	Adult	Concession		Adult	Concession		Adult	Concession	
\$0.00	8%	8%	\$0.00	7%	7%	\$0.00	7%	8%	\$0.00
\$2.00	19%	19%	\$0.92	22%	22%	\$0.96	21%	22%	\$0.95
\$3.00	23%	28%	\$2.12	23%	27%	\$2.11	23%	27%	\$2.11
\$4.00	27%	27%	\$3.08	26%	26%	\$3.08	26%	26%	\$3.08
\$5.00	18%	14%	\$4.19	17%	14%	\$4.19	17%	14%	\$4.19
\$7.00	5%	4%	\$5.67	4%	3%	\$5.71	4%	3%	\$5.71
Over \$7.00	1%	1%	\$7.29	1%	1%	\$7.37	1%	1%	\$7.36
ALL	100%	100%	\$2.55	100%	100%	\$2.51	100%	100%	\$2.52

Source: Frontier Economics calculations using data provided by TfNSW

Replication of TfNSW's Average Adult
Fares

Table 3: Frontier Economics' replication of TfNSW's projected Opal card Trip Distribution and Average Adult fare for 2018-19

Fare Up To	Holiday			Normal			Total		
	Trip Distribution		Average Fare	Trip Distribution		Average Fare	Trip Distribution		Average Fare
	Adult	Concession		Adult	Concession		Adult	Concession	
\$0.00	8%	8%	\$0.00	7%	7%	\$0.00	7%	8%	\$0.00
\$2.00	19%	19%	\$0.96	22%	22%	\$1.00	21%	22%	\$0.99
\$3.00	23%	27%	\$2.15	23%	26%	\$2.14	23%	26%	\$2.14
\$4.00	27%	27%	\$3.13	26%	26%	\$3.14	26%	26%	\$3.14
\$5.00	13%	11%	\$4.15	12%	11%	\$4.15	12%	11%	\$4.15
\$7.00	10%	7%	\$5.16	9%	7%	\$5.13	9%	7%	\$5.14
Over \$7.00	1%	1%	\$7.45	1%	1%	\$7.41	1%	1%	\$7.42
ALL	100%	100%	\$2.61	100%	100%	\$2.57	100%	100%	\$2.58

Source: Frontier Economics calculations using data provided by TfNSW

Replication of TfNSW's Average Adult Fares

Table 4: Frontier Economics' replication of TfNSW's observed Single Trip Ticket Distribution and Average Adult fare for 2017-18

Fare Up To	Holiday			Normal			Total		
	Trip Distribution		Average Fare	Trip Distribution		Average Fare	Trip Distribution		Average Fare
	Adult	Concession		Adult	Concession		Adult	Concession	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	23%	22%	\$2.36	23%	26%	\$2.36	23%	25%	\$2.36
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	36%	37%	\$3.85	40%	40%	\$3.85	40%	39%	\$3.85
\$7.00	21%	23%	\$5.04	21%	23%	\$5.03	21%	23%	\$5.03
Over \$7.00	19%	18%	\$7.60	16%	12%	\$7.67	16%	13%	\$7.65
ALL	100%	100%	\$4.49	100%	100%	\$4.32	100%	100%	\$4.35

Source: Frontier Economics calculations using data provided by TfNSW

Replication of TfNSW's Average Adult
Fares

Table 5: Frontier Economics' replication of TfNSW's proposed Single Trip Ticket Distribution and Average Adult fare for 2018-19

Fare Up To	Holiday			Normal			Total		
	Trip Distribution		Average Fare	Trip Distribution		Average Fare	Trip Distribution		Average Fare
	Adult	Concession		Adult	Concession		Adult	Concession	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	23%	22%	\$2.55	23%	26%	\$2.55	23%	25%	\$2.55
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	36%	37%	\$4.00	40%	40%	\$4.00	40%	39%	\$4.00
\$7.00	21%	23%	\$5.22	21%	23%	\$5.22	21%	23%	\$5.22
Over \$7.00	19%	18%	\$7.86	16%	12%	\$7.93	16%	13%	\$7.92
ALL	100%	100%	\$4.68	100%	100%	\$4.51	100%	100%	\$4.54

Source: Frontier Economics calculations using data provided by TfNSW

Replication of TfNSW's Average Adult Fares

3 Testing whether the 2017-18 sample period is reasonable

TfNSW propose to use the seven week representative period from 26 February 2018 to 15 April 2018 that TfNSW proposes to use as the starting point for the 2018-19 Trip Distribution. In this Section we outline sensitivity analysis of alternative representative periods. In order to facilitate this sensitivity analysis, we have been provided with:

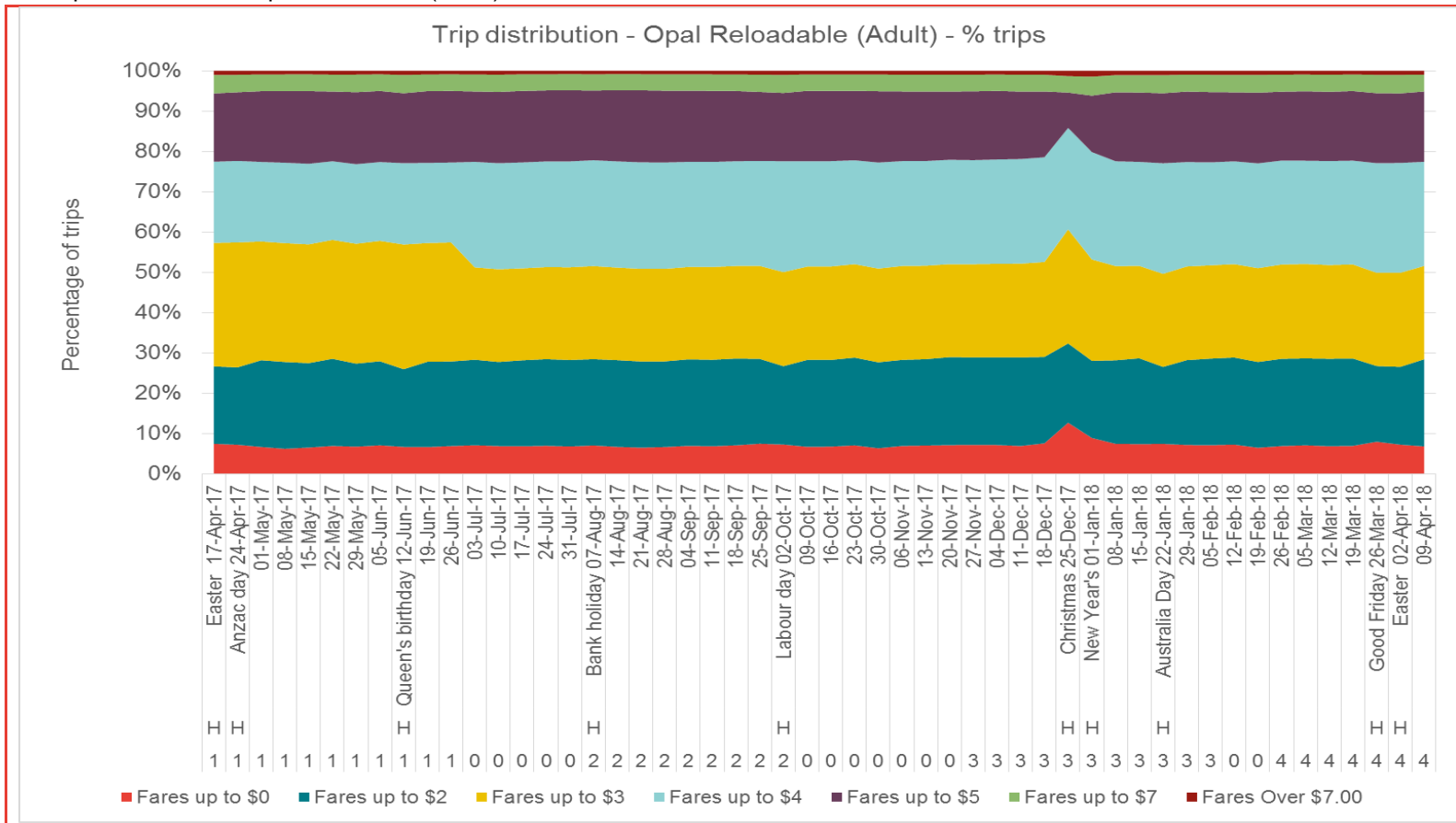
- 52 weeks of Opal reloadable trip data from 17 April 2017 to 16 April 2018; and
- 41 weeks of Single Trip Ticket data from 3 July 2017 to 16 April 2018.

In Figure 1, Figure 2, Figure 3, and Figure 4 we show how Trip Distributions vary across the year for Opal reloadable (Adult), Opal reloadable (Concession), Single Trip Tickets (Adult) and Single Trip Tickets (Concession) trips, respectively. Holiday weeks are marked as 'H' in the X-axis of these charts. Alternative sample periods 1 - 4 can also be seen in the X-axis of these charts (see the description of alternative periods listed below) in Table 6 and Table 7, we show how Trip Distribution and Average Adult Fares would differ under the following alternative sample periods, all of which have a mix of holiday and normal weeks.

- Alternative period 1: 17 April to 2 July (including Easter Monday, Anzac day and Queen's birthday)
- Alternative period 2: 7 August to 9 October (including August bank holiday and Labour day)
- Alternative period 3: 27 November to 12 Feb (including Christmas/New year's and Australia day)
- Alternative period 4 (**representative period chosen by TfNSW**): 26 Feb to 15 April (including good Friday/Easter Monday)

On the basis of our findings, we can provide assurance that the Trip Distribution and The Average Adult Fare would not be significantly different if an alternative sample period was used. The seven week representative period from 26 February 2018 to 15 April 2018 that TfNSW proposes to use as the starting point for the 2018-19 Trip Distribution is reasonable.

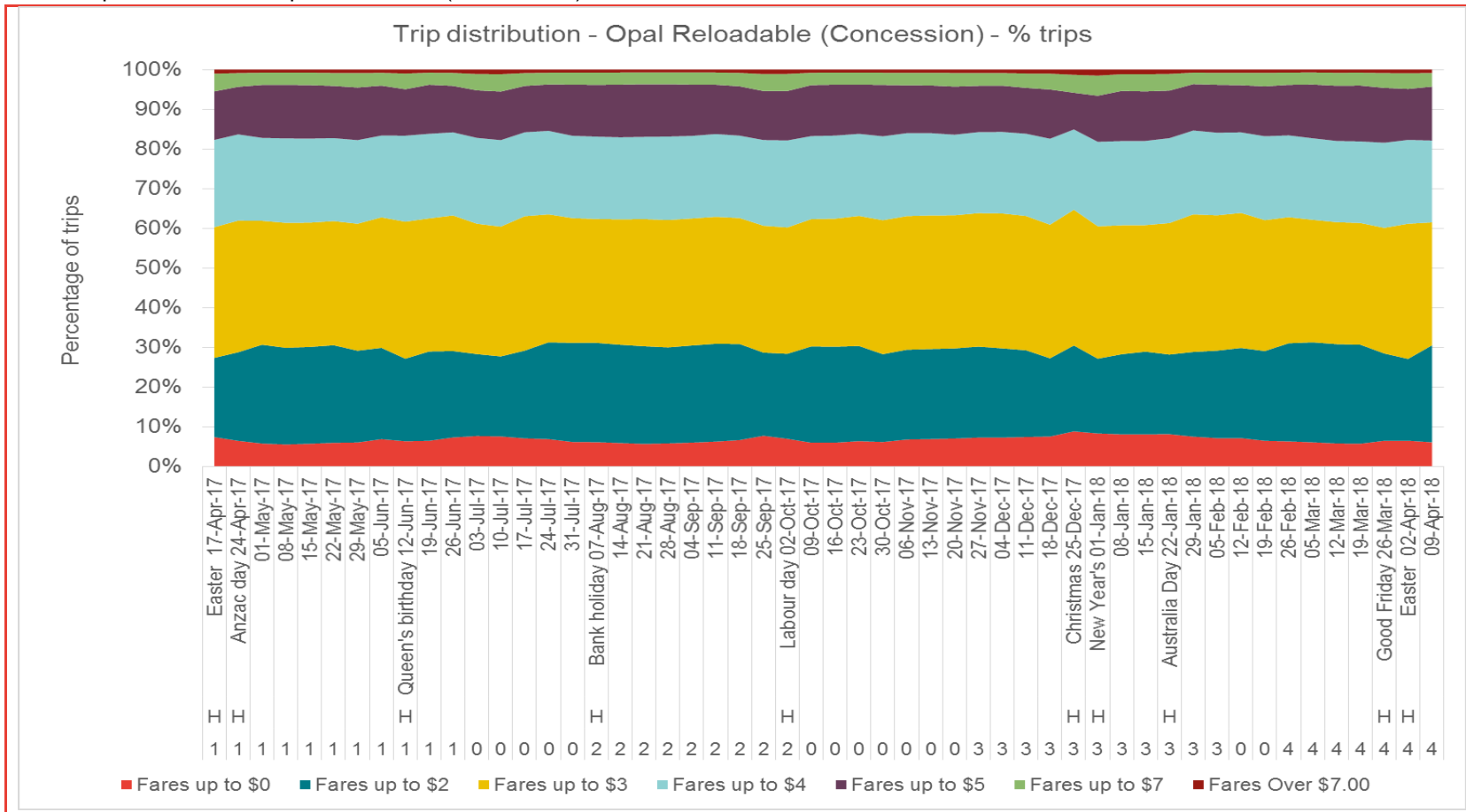
Figure 1: 'Trip Distribution' – Opal reloadable (Adult)



Source: Frontier Economics analysis of data provided by TfNSW

Testing whether the 2017-18 sample period is reasonable

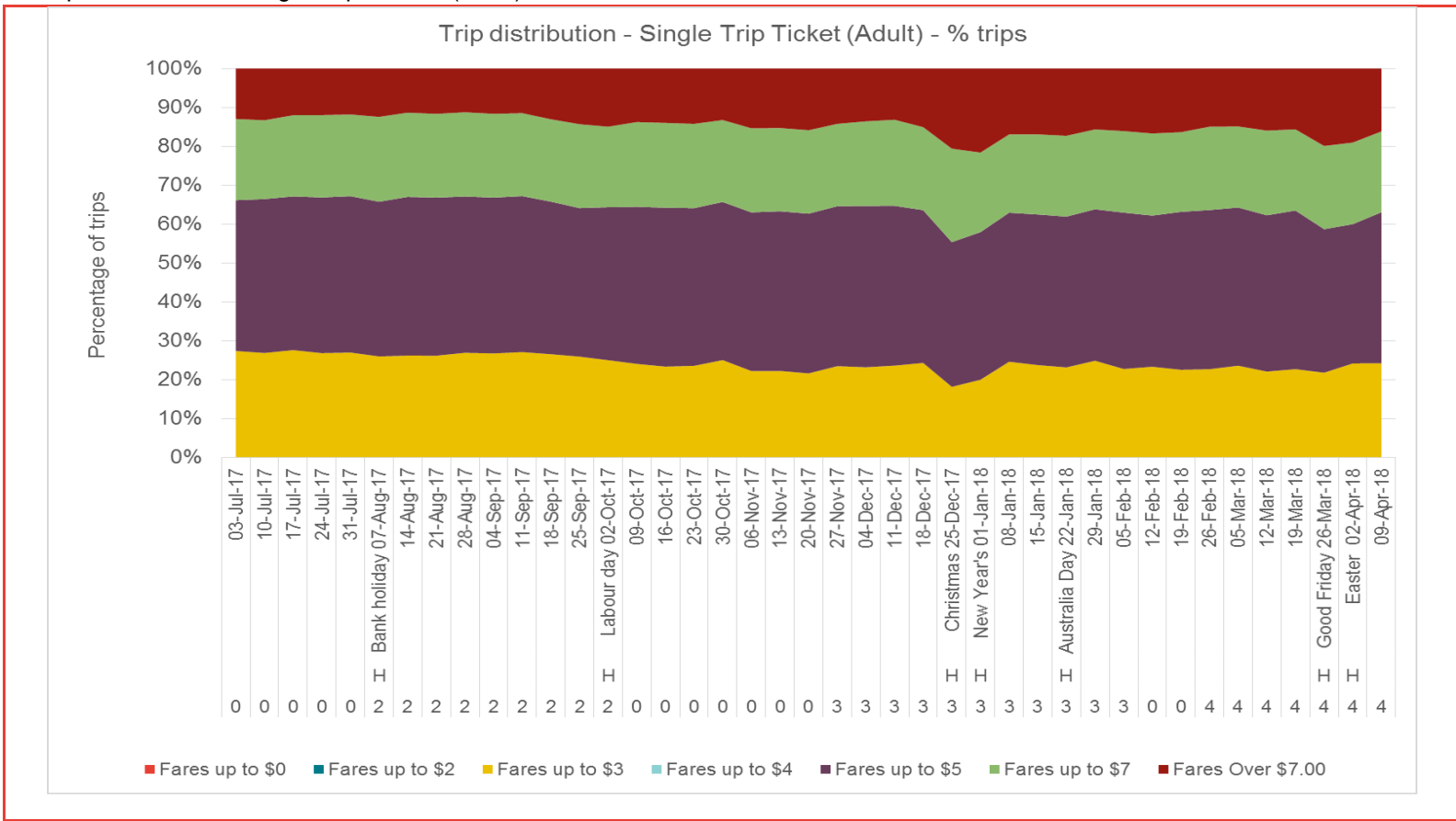
Figure 2: 'Trip Distribution' – Opal reloadable (Concession)



Source: Frontier Economics analysis of data provided by TfNSW

Testing whether the 2017-18 sample period is reasonable

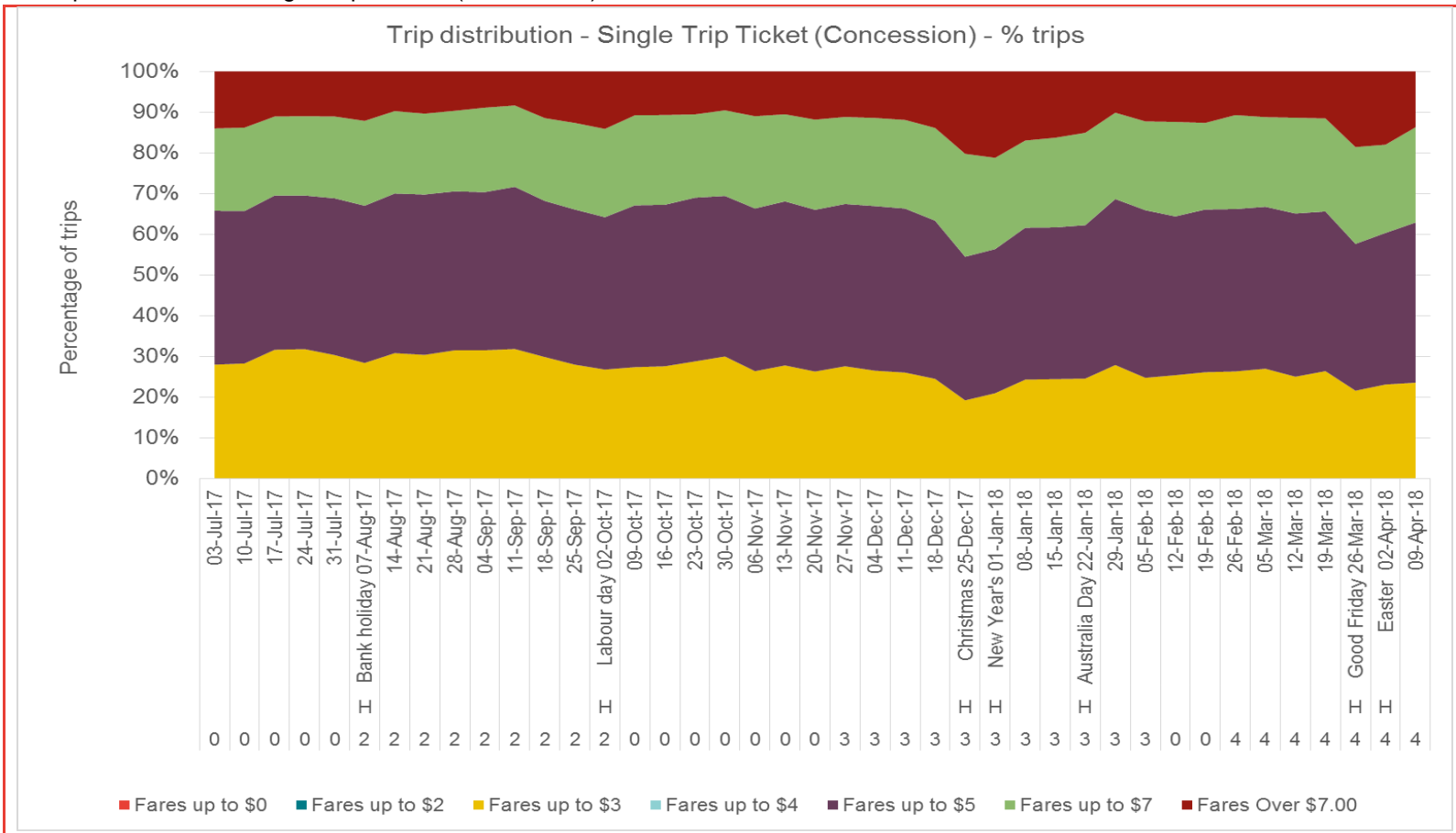
Figure 3: 'Trip Distribution' – Single Trip Tickets (Adult)



Source: Frontier Economics analysis of data provided by TfNSW

Testing whether the 2017-18 sample period is reasonable

Figure 4: 'Trip Distribution' – Single Trip Tickets (Concession)



Source: Frontier Economics analysis of data provided by TfNSW

Testing whether the 2017-18 sample period is reasonable

Table 6: Frontier Economics' testing of alternative Trip Distributions - Opal reloadable

Difference between Alternative period 1 (17 April to 2 July) and TfNSW's proposed representative period (26 Feb to 15 April):									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	0%	-1%	\$0.00	0%	-1%	\$0.00	0%	-1%	\$0.00
\$2.00	0%	2%	-\$0.03	0%	1%	-\$0.02	0%	1%	-\$0.02
\$3.00	8%	6%	\$0.09	6%	5%	\$0.08	6%	6%	\$0.08
\$4.00	-7%	-5%	\$0.05	-6%	-5%	\$0.04	-6%	-5%	\$0.04
\$5.00	0%	-2%	-\$0.10	0%	-1%	-\$0.10	0%	-1%	-\$0.10
\$7.00	0%	0%	-\$0.13	0%	0%	-\$0.12	0%	0%	-\$0.12
Over \$7.00	0%	0%	-\$0.15	0%	0%	-\$0.15	0%	0%	-\$0.15
ALL	0%	0%	-\$0.06	0%	0%	-\$0.04	0%	0%	-\$0.04

Difference between Alternative period 2 (7 August to 9 October) and TfNSW's proposed representative period (26 Feb to 15 April):									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	0%	-2%	\$0.00	0%	-1%	\$0.00	0%	-1%	\$0.00
\$2.00	1%	5%	\$0.03	0%	2%	\$0.01	0%	2%	\$0.02
\$3.00	0%	4%	\$0.02	0%	5%	\$0.02	0%	5%	\$0.02
\$4.00	0%	-6%	\$0.02	1%	-5%	\$0.01	0%	-5%	\$0.01
\$5.00	0%	-1%	\$0.00	0%	-1%	\$0.00	0%	-1%	\$0.00
\$7.00	0%	0%	\$0.02	0%	0%	\$0.01	0%	0%	\$0.01
Over \$7.00	0%	0%	\$0.00	0%	0%	-\$0.01	0%	0%	-\$0.01
ALL	0%	0%	-\$0.03	0%	0%	\$0.01	0%	0%	\$0.00

Difference between Alternative period 3 (27 November to 12 Feb) and TfNSW's proposed representative period (26 Feb to 15 April):									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	2%	0%	\$0.00	0%	0%	\$0.00	1%	0%	\$0.00
\$2.00	0%	2%	-\$0.02	0%	-1%	\$0.00	0%	-1%	\$0.00
\$3.00	2%	6%	\$0.03	0%	7%	\$0.02	0%	7%	\$0.02
\$4.00	-1%	-6%	\$0.01	0%	-5%	\$0.01	0%	-5%	\$0.01
\$5.00	-4%	-3%	-\$0.01	0%	-2%	\$0.00	-1%	-2%	\$0.00
\$7.00	0%	1%	-\$0.12	0%	0%	-\$0.02	0%	0%	-\$0.04
Over \$7.00	0%	0%	-\$0.26	0%	0%	-\$0.07	0%	0%	-\$0.11
ALL	0%	0%	-\$0.11	0%	0%	\$0.00	0%	0%	-\$0.02

Source: Frontier Economics analysis of data provided by TfNSW

Testing whether the 2017-18 sample period is reasonable

Table 7: Frontier Economics' testing of alternative Trip Distributions - Single Trip Tickets

Difference between Alternative period 2 (7 August to 9 October) and TfNSW's proposed representative period (26 Feb to 15 April):									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average Fare	Trip distribution		Average Fare	Trip distribution		Average Fare
	Adult	Concs.		Adult	Concs.		Adult	Concs.	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	3%	5%	\$0.00	3%	5%	\$0.00	3%	5%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	3%	1%	\$0.00	0%	-1%	\$0.02	0%	0%	\$0.02
\$7.00	0%	-1%	\$0.01	0%	-3%	\$0.02	0%	-2%	\$0.02
Over \$7.00	-6%	-5%	\$0.02	-3%	-1%	-\$0.10	-4%	-2%	-\$0.08
ALL	0%	0%	-\$0.25	0%	0%	-\$0.17	0%	0%	-\$0.18
Difference between Alternative period 3 (27 November to 12 Feb) and TfNSW's proposed representative period (26 Feb to 15 April):									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average Fare	Trip distribution		Average Fare	Trip distribution		Average Fare
	Adult	Concs.		Adult	Concs.		Adult	Concs.	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	-3%	-1%	\$0.00	1%	0%	\$0.00	0%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	2%	-1%	\$0.00	0%	0%	\$0.01	0%	0%	\$0.01
\$7.00	1%	1%	\$0.01	0%	-1%	\$0.02	0%	-1%	\$0.02
Over \$7.00	1%	1%	\$0.03	0%	2%	-\$0.06	0%	2%	-\$0.05
ALL	0%	0%	\$0.07	0%	0%	-\$0.01	0%	0%	\$0.00

Source: Frontier Economics analysis of data provided by TfNSW

4 Testing the impact of the Opal Day Pass trial

TfNSW propose to introduce a new Opal product in 2018-19 – Opal One Day Travel Pass (“Opal Day Pass”) at a price of \$19 Adult/\$9.50 Child without airport access and \$33.30 Adult/\$22.30 Child.

Page 2 of TfNSW’s pricing proposal states that it is expected that less than 15,000 full price Opal Day Pass will be sold in 2018-19.

“The Opal Day Pass trial was considered but it is not expected to impact Trip Distribution in 2018-19 due to low numbers. During the trial, the Opal Day Pass will not be available for general sale to the public but only be distributed through tour operators such as cruise ship companies. It is expected that less than 15,000 full price Opal Day Pass will be sold in 2018-19, representing less than 0.01 per cent of patronage.”

In order to test whether the introduction of the Opal Day Pass trial will have a significant impact in 2018-19, we test the impact on the projected 2018-19 Single Trip Ticket Trip Distribution and Average Adult Fare of adding between 15,000 and 500,000 full price Opal Day Pass tickets. Table 8 below shows the following.

- Adding 15,000 Opal Day Passes (in line with TfNSW’s expectations for 2018-19) would:
 - increase the projected 2018-19 Average Adult Fare for Single Trip Tickets by only \$0.03; and
 - have virtually no impact on the Trip Distribution for Single Trip Tickets.
- Adding 30,000 Opal Day Passes (two times TfNSW’s expectations) would
 - increase the projected 2018-19 Average Adult Fare for Single Trip Tickets by only \$0.06;
 - have virtually no impact on the Trip Distribution for Single Trip Tickets.
- Adding 500,000 Opal Day Passes (more than 33 times TfNSW’s expectations) would
 - increase the projected 2018-19 Average Adult Fare for Single Trip Tickets by \$1.03.
 - increase the proportion of trips in the over \$7 price band for Single Trip Tickets by 5%.

While this would result in a significant increase in the Average Adult Fare for Single Trip Tickets, we note that IPART’s 13% overall cap would not be breached even under this very high scenario which we have used solely for the purposed of sensitivity testing.

As Single Trip Tickets comprise of less than 2% of total trips (Opal reloadable tickets comprising over 98% of trips), the introduction of the Opal Day Pass will have an immaterial impact of the overall Average Adult Fare.

Based on our findings, we can provide assurance that the Opal Day Pass trial will have an immaterial impact Trip Distribution and Average Adult Fare in 2018-19 due to low projected numbers.

Table 8: Frontier Economics' sensitivity analysis of Opal Day Pass trial on the projected 2018-19 Single Trip Ticket Trip Distribution

Impact of adding 15,000 Opal Day Passes									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$7.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
Over \$7.00	0%	0%	\$0.14	0%	0%	\$0.18	0%	0%	\$0.17
ALL	0%	0%	\$0.03	0%	0%	\$0.03	0%	0%	\$0.03

Impact of adding 30,000 Opal Day Passes									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$7.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
Over \$7.00	0%	0%	\$0.28	0%	0%	\$0.36	0%	0%	\$0.35
ALL	0%	0%	\$0.07	0%	0%	\$0.06	0%	0%	\$0.06

Impact of adding 500,000 Opal Day Passes									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average	Trip distribution		Average	Trip distribution		Average
	Adult	Concs.	Fare	Adult	Concs.	Fare	Adult	Concs.	Fare
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	-1%	0%	\$0.00	-1%	0%	\$0.00	-1%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	-2%	0%	\$0.00	-2%	0%	\$0.00	-2%	0%	\$0.00
\$7.00	-1%	0%	\$0.00	-1%	0%	\$0.00	-1%	0%	\$0.00
Over \$7.00	5%	0%	\$3.81	5%	0%	\$4.56	5%	0%	\$4.43
ALL	0%	0%	\$1.04	0%	0%	\$1.03	0%	0%	\$1.03

Source: Frontier Economics analysis of data provided by TfNSW

5 Sensitivity analysis of the use of contactless payments

TfNSW's pricing proposal is based on the assumption that the number of contactless payment is not expected to impact Trip Distribution in 2018-19.

Page 2 of TfNSW's pricing proposal states that:

"Similarly, the use of contactless payment is not expected to impact Trip Distribution in 2018-19. Contactless is now available on ferries and light rail but Opal reloadable cards remain the most popular payment method. Recent data shows that less than 0.05 per cent of trips were paid for via contactless payment."

In order to test whether contactless payments will have a significant impact on the Trip Distribution in 2018-19, we test the impact on the projected 2018-19 Single Ticket Trip Distribution and Average Adult Fare of increasing the number of projected contactless payments by a factor of between 2 and 8. Table 9 below shows the following.

- If the number of contactless payments were doubled (two times higher than TfNSW's expectations):
 - the projected Average Adult Fare for Single Trip Tickets would increase by \$0.05; and
 - the proportion of trips in the over \$7 price band for Single Trip Tickets would increase by 2%.
- If the number of contactless payments was four times higher than TfNSW's expectations:
 - the projected Average Adult Fare for Single Trip Tickets would increase by \$0.14; and
 - the proportion of trips in the over \$7 price band for Single Trip Tickets would increase by 5%.
- If the number of contactless payments was eight times higher than TfNSW's expectations:
 - the projected Average Adult Fare for Single Trip Tickets would increase by \$0.30; and
 - the proportion of trips in the over \$7 price band for Single Trip Tickets would increase by 10%.

As Single Trip Tickets comprise of less than 2% of total trips (Opal reloadable tickets comprising over 98% of trips), even a potential eight time increase in

contactless payments will have an immaterial impact of the overall Average Adult Fare.

Based on our findings, we can provide assurance that the contactless payments will have an immaterial impact Trip Distribution and Average Adult Fare in 2018-19 due to low projected numbers.

Table 9: Frontier Economics' sensitivity analysis of contactless payments on the projected 2018-19 Single Ticket Trip Distribution

Impact of doubling the number of contactless payments									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average Fare	Trip distribution		Average Fare	Trip distribution		Average Fare
	Adult	Concs.		Adult	Concs.		Adult	Concs.	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	-1%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	-1%	0%	\$0.00	-1%	0%	\$0.00	-1%	0%	\$0.00
\$7.00	-1%	0%	\$0.00	0%	0%	\$0.00	-1%	0%	\$0.00
Over \$7.00	2%	0%	-\$0.02	1%	0%	-\$0.02	2%	0%	-\$0.02
ALL	0%	0%	\$0.07	0%	0%	\$0.04	0%	0%	\$0.05

Impact of having 4 times more contactless payments									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average Fare	Trip distribution		Average Fare	Trip distribution		Average Fare
	Adult	Concs.		Adult	Concs.		Adult	Concs.	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	-1%	0%	\$0.00	-1%	0%	\$0.00	-1%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	-3%	0%	\$0.00	-2%	0%	\$0.00	-2%	0%	\$0.00
\$7.00	-2%	0%	\$0.00	-1%	0%	\$0.00	-1%	0%	\$0.00
Over \$7.00	7%	0%	-\$0.05	4%	0%	-\$0.04	5%	0%	-\$0.04
ALL	0%	0%	\$0.20	0%	0%	\$0.12	0%	0%	\$0.14

Impact of having 8 times more contactless payments									
Fare up to:	Holiday			Normal			Total		
	Trip distribution		Average Fare	Trip distribution		Average Fare	Trip distribution		Average Fare
	Adult	Concs.		Adult	Concs.		Adult	Concs.	
\$0.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$2.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$3.00	-3%	0%	\$0.00	-2%	0%	\$0.00	-2%	0%	\$0.00
\$4.00	0%	0%	\$0.00	0%	0%	\$0.00	0%	0%	\$0.00
\$5.00	-6%	0%	\$0.00	-4%	0%	\$0.00	-5%	0%	\$0.00
\$7.00	-5%	0%	\$0.00	-3%	0%	\$0.00	-3%	0%	\$0.00
Over \$7.00	14%	0%	-\$0.09	9%	0%	-\$0.07	10%	0%	-\$0.07
ALL	0%	0%	\$0.42	0%	0%	\$0.27	0%	0%	\$0.30

Source: Frontier Economics analysis of data provided by TfNSW

Note: We note that the purpose of our analysis in this section is to test the illustrative impact of an increase in the number of contactless payments. In order to do so, we simply increase the number of projected contactless payments in 2018-19 by a factor of between 2 and 8 (without reducing the number of Opal Reloadable and remaining Single Ticket trips by a commensurate amount). The results in Table 9 therefore are likely to overstate the impacts on Trip Distribution and Average Adult Fare.

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