Traffic Engineering & Management Ltd
Level 2, 1b Buscomb Avenue,
Henderson, Auckland
PO Box 21-803, Henderson, Auckland 0650

MacDonell Consulting Ltd

Ref: 18122
11 February 2020

By email; bmacdonell@xtra.co.nz

Attn: Barry MacDonell

Dear Barry

PRIVATE PLAN CHANGE – MADDIES ROAD, KAUKAPAKAPA
ASSESSMENT OF TRAFFIC EFFECTS ON KAIPARA COAST HIGHWAY

As requested we have considered potential traffic generation effects associated with a proposed private plan change for land to the west of Maddies Road, north of Kaukapakapa. The plan change seeks to rezone the land from Rural Production to Rural Countryside Living. Rezoning of the land will facilitate subsequent subdivision of the land to establish up to 20 lots within the Countryside Living Zoning provision.

The proposed plan change covers four separate properties with a combined area of approximately 28.76 hectares. The area covered by the plan change is highlighted in Figure 1.

Source: C & R Surveyors Ltd – Proposed Plan Change Area May 2018

Figure 1: Proposed Plan Change Area

The plan change area has road frontage with Alpine Road to the west and connection with Maddies Road to the east. Alpine Road connects with McLachlan Road to the north of the site with sole access

to Kaipara Coast Highway/State Highway 16 (SH16) via an existing intersection further north. Alpine Road and a large proportion of McLachlan Road are currently unsealed with generally narrow carriageway width. The intersection of SH16 and McLachlan Road is located approximately 1.7km north of the intersection of SH16 and Moses Road.

Maddies Road is a short road with cul-de-sac turning head for access to six existing Countryside Living (CL) lots. Maddies Road connects with SH16 via Moses Road and a relatively new intersection constructed to provide access for CL zoned land on Moses Road and Maddies Road. We understand that the Moses Road intersection was designed and constructed in 2006 to 2007. We note that the design and construction of the intersection with extensive flush median, formal right turn bay and provision for safe deceleration and turning for left turning vehicles into Moses Road was undertaken to required standards for a 100km/h posted speed limit. Subsequent to the construction of the intersection the speed limit on SH16 past the intersection with Moses Road was reduced to 80km/h.

Consideration of intersection of SH16 with Moses Road

We consider that the most practical access option for future CL lots provided for by the proposed plan change is via Maddies Road, Moses Road and the intersection with SH16. As noted above the intersection was designed to comply with design standards for a 100km/h posted speed limit and the current speed limit at the intersection is now 80km/h. A review of recent crash data for SH16 between North Crescent in Kaukapakapa to the south of Moses Road and Kanohi Road to the north identified four crashes including one minor-injury crash over the five year period of 2015 to 2019. The minor-injury crash involved loss of control on the curve north of the Maddies Road intersection at night with a driver assessed to be above the legal alcohol limit. Overall the reported crashes do not highlight any concern regarding the operation of the Maddies road intersection. A copy of the crash listing and diagram is included as Attachment 1.

We have undertaken capacity analysis of the intersection of SH16 with Moses Road for both existing and future operation with additional CL lots provided for by the proposed plan change. The intersection capacity analysis used SIDRA intersection modelling software for the existing intersection layout and assessed vehicle operating speeds on approaches to the intersection. The following subsections outline the methodology followed to determine traffic volumes for assessment purposes.

Traffic movements to and from Moses Road

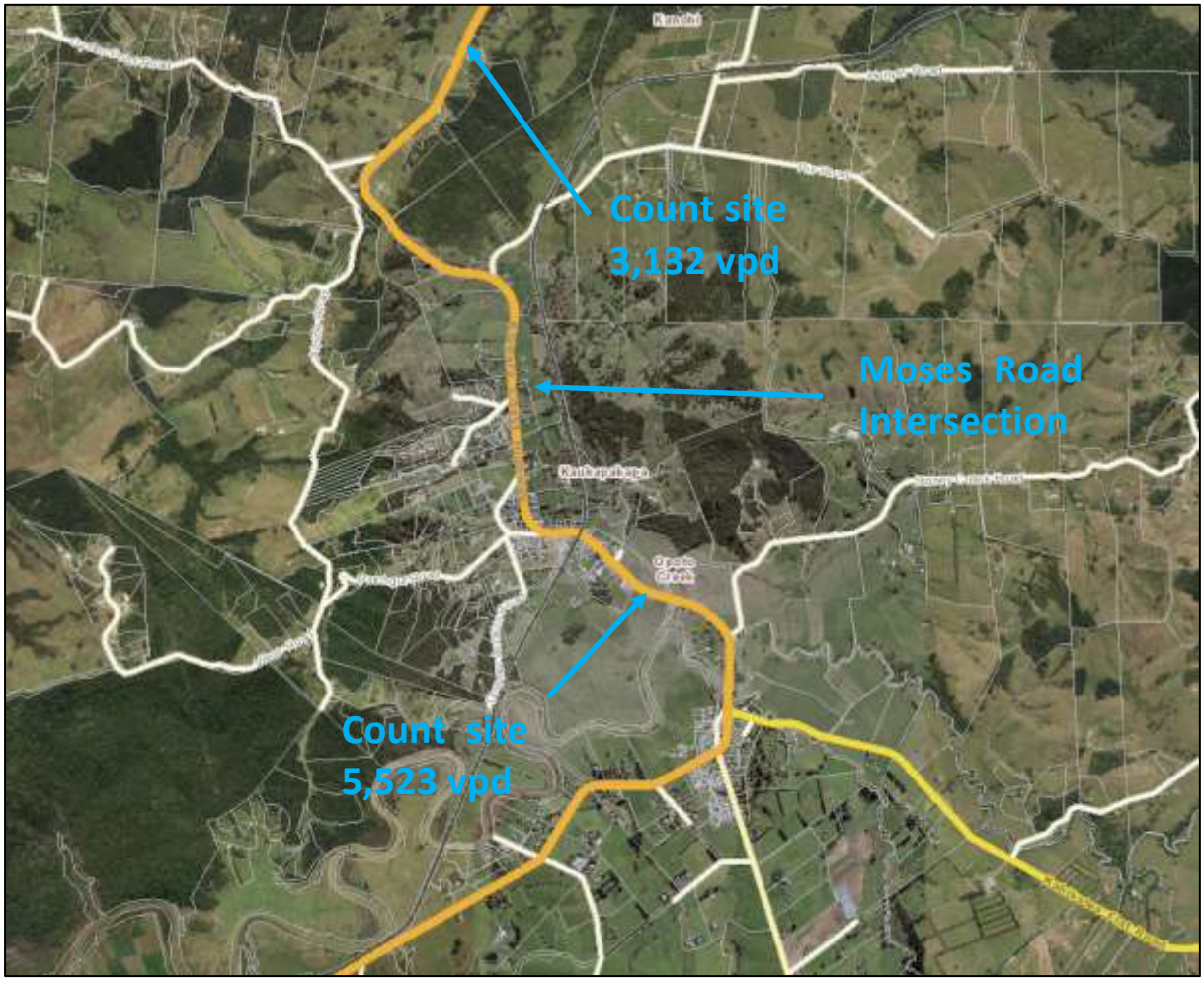
The following points are noted in relation to determining turning movements to and from Moses Road and Maddies Road at the intersection.

- There are currently around 35 lots that gain access onto Moses Road and Maddies Road with sole access via the intersection with SH16
- The proposed private plan change will provide for up to a further 20 lots to be accessed via the existing intersection
- An average trip generation rate of one (1) trip per lot during morning and evening peak hour periods has been adopted for the purpose of this assessment
- A directional split of around 80 percent outbound and 20 percent inbound during the morning peak and the reverse pattern in the evening peak has been adopted
- A directional split for turning movements at the intersection of between 80 and 90 percent to and from the south has been adopted

Assessed traffic volumes to and from Moses Road at the intersection with SH16 are 35 vehicle movements during each peak hour period for the current situation, increasing to 55 movements per hour with additional CL lots provided under the proposed plan change.

Traffic volumes on SH16

Current traffic volumes on SH16 have been sourced from the New Zealand Transport Agency (NZTA). Annual summary traffic volumes are available up to 2018 with a site immediately south of Kaukapakapa (1.5km south of Moses Road) recorded at an average daily volume of 5,523 for the two-way total. A separate count site located approximately 2.5km north of the Moses Road intersection was recorded at an average of 3,132 vehicles per day (vpd). Comparison of the two traffic count sites highlights a significant reduction in SH16 traffic volumes to the north of Kaukapakapa, including past the Moses Road intersection. Figure 2 identifies the two traffic count locations in relation to the Moses Road intersection.



Source: Auckland Council Geomaps – Traffic volumes NZTA website; recorded 2018 AADT (annual average daily traffic)

Figure 2: Location of NZTA Count Sites

We consider that an appropriate method to derive traffic volumes at the Moses Road intersection is to initially adopt the mean value between the two count sites. The Kaukapakapa township will account for the majority of the drop-off at the northern count site and adopting the mean value for the intersection located north of Kaukapakapa is considered to be a conservative approach. The mean daily traffic volume is 4,327 vpd which is approximately 78% of the recorded AADT at the count site south of Kaukapakapa.

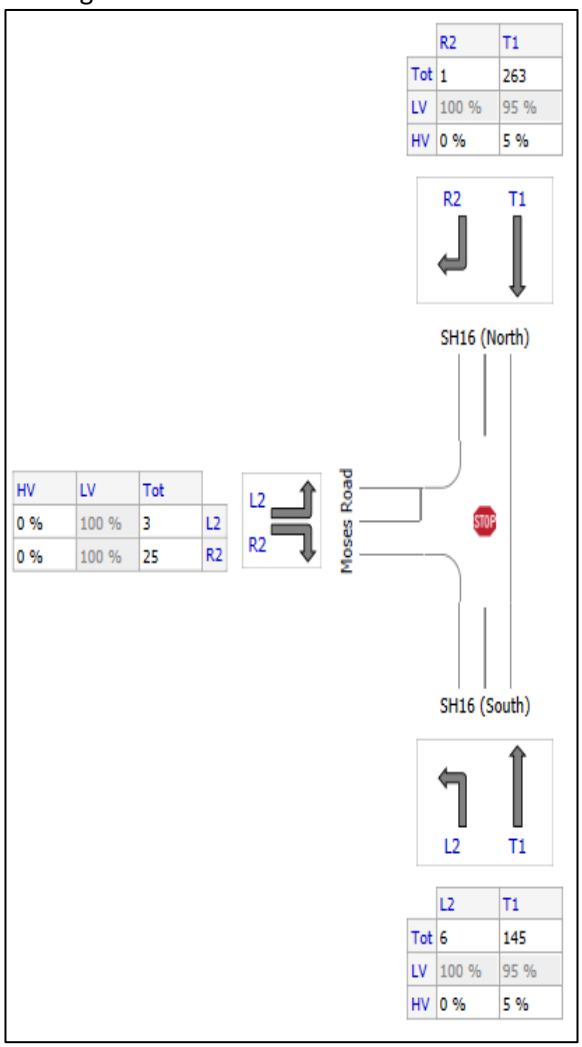
We have sourced detail traffic count information from NZTA to determine hourly traffic volumes on SH16. The traffic count site south of Kaukapakapa is a continuous site for which daily traffic count data was available for 2019. In considering the traffic data available we have adopted daily and peak hour values that represent equivalent 85th percentile volumes for each direction as a base for assessment. Relevant values from the NZTA count data to the south of Kaukapakapa are outlined below.

- SH16 Northbound 3,222vpd (3 May 2019)
- SH16 Southbound 3,138vpd (21 November 2019)
- SH16 Combined 2-way (85th percentile equivalent) 6,360vpd
- Annual average daily traffic (NZTA reported value – 2018) 5,523vpd

For assessment purposes peak hour volumes on SH16 at the Moses Road intersection were taken to be 80% of the relevant volumes recorded on the two 85th percentile dates noted above. A summary of NZTA traffic data collected and used to determine appropriate volumes at the Moses Road intersection is included as Attachment 2.

Figure 3 below presents adopted peak hour traffic volumes for the SH16 and Moses Road intersection for the existing, base operation.

Existing AM Peak Hour



Existing PM Peak Hour

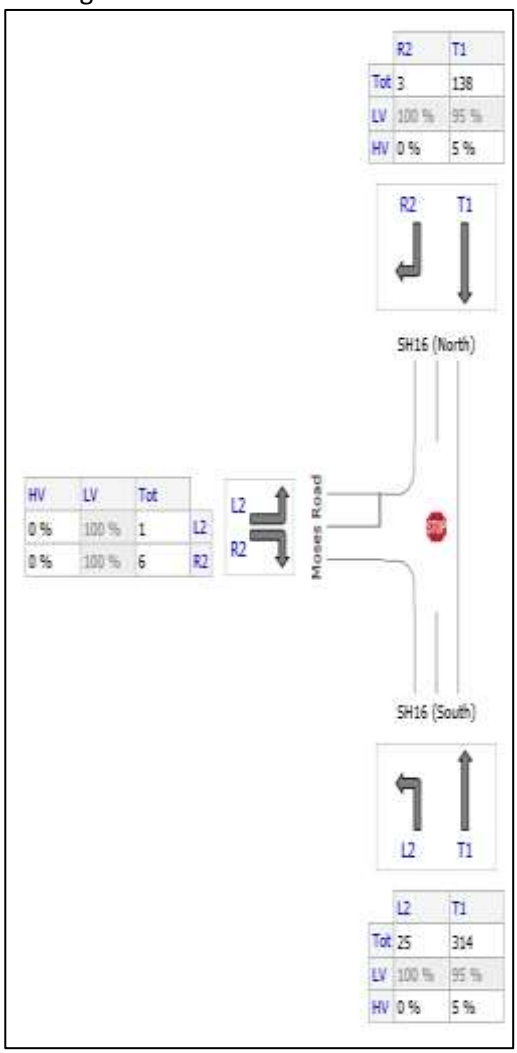


Figure 3: Adopted Base Traffic Volumes at Moses Road Intersection

Summary Findings from SIDRA Intersection Modelling

We undertook a series of SIDRA intersection model runs to reflect morning and evening peak hour periods for both the existing 35 lots on Moses Road and Maddies Road, and the future 55 lots under the proposed plan change. Summary model output is provided for all SIDRA model runs as Attachment 3 to this letter. The following points are noted for the predicted intersection operation under existing and proposed scenarios, with current background volumes on SH16.

- The right turn from Moses Road to SH16 experiences the highest delay in both peak hour periods
- The right turn from Moses Road has a level of service (LOS) B with all other movements at the intersection being LOS A
- Predicted delay values to and from Moses Road are almost entirely geometric and 'Stop' control delay rather than delay associated with priority traffic on SH16
- The predicted delay and queuing values at the intersection were essentially unchanged between the existing and proposed scenarios

In summary the intersection currently operates with no notable queuing or delay and the addition of 20 further CL lots accessed via the intersection generates no discernible impact on operation.

We undertook further intersection modelling to test future resilience of the intersection following growth to SH16 traffic volumes. The test scenarios applied percentage increases to the base SH16 peak hour traffic volumes at the intersection of 20% and 50%. The test scenario with a 20% increase in SH16 volumes results in no noticeable increase in delay or queuing at the intersection. The test scenario with a 50% increase to SH 16 volumes resulted in a minor increase in delay and queuing at the intersection and the right turn movement from Moses Road deteriorating from LOS B to LOS C during the evening peak hour. As noted above summary model output results are included as Attachment 3. Tables below are taken from Attachment 3 and present a comparison between the base scenario and a test scenario of 20 additional lots accessing via the intersection and SH16 volumes increasing by 50%.

Weekday morning peak hour – Base Scenario

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	6	0.0	0.003	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	153	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		159	4.8	0.080	0.3	NA	0.0	0.0	0.00	0.03	0.00	79.3
North: SH16 (North)												
8	T1	277	5.0	0.145	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.26	0.56	0.26	53.8
Approach		278	5.0	0.145	0.0	NA	0.0	0.0	0.00	0.00	0.00	84.8
West: Moses Road												
10	L2	3	0.0	0.003	3.7	LOS A	0.0	0.1	0.24	0.40	0.24	53.6
12	R2	26	0.0	0.050	10.8	LOS B	0.2	1.3	0.52	0.92	0.52	46.8
Approach		29	0.0	0.050	10.1	LOS B	0.2	1.3	0.49	0.86	0.49	47.4
All Vehicles		466	4.6	0.145	0.8	NA	0.2	1.3	0.03	0.06	0.03	80.0

Weekday morning peak hour – Base Scenario plus Proposed 20 lots and 50% increase in SH16 volumes

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	9	0.0	0.005	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	229	5.0	0.120	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		239	4.8	0.120	0.3	NA	0.0	0.0	0.00	0.02	0.00	79.3
North: SH16 (North)												
8	T1	416	5.0	0.218	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	2	0.0	0.002	8.0	LOS A	0.0	0.0	0.33	0.57	0.33	53.5
Approach		418	5.0	0.218	0.1	NA	0.0	0.0	0.00	0.00	0.00	84.7
West: Moses Road												
10	L2	5	0.0	0.005	4.0	LOS A	0.0	0.1	0.31	0.43	0.31	53.3
12	R2	41	0.0	0.114	15.0	LOS B	0.4	2.8	0.67	1.00	0.67	43.7
Approach		46	0.0	0.114	13.7	LOS B	0.4	2.8	0.63	0.94	0.63	44.6
All Vehicles		703	4.6	0.218	1.0	NA	0.4	2.8	0.04	0.07	0.04	79.4

Weekday evening peak hour – Base Scenario

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	26	0.0	0.014	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	331	5.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		357	4.6	0.173	0.5	NA	0.0	0.0	0.00	0.05	0.00	78.6
North: SH16 (North)												
8	T1	145	5.0	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	3	0.0	0.003	8.6	LOS A	0.0	0.1	0.41	0.60	0.41	53.1
Approach		148	4.9	0.076	0.2	NA	0.0	0.1	0.01	0.01	0.01	84.2
West: Moses Road												
10	L2	1	0.0	0.001	4.5	LOS A	0.0	0.0	0.38	0.44	0.38	53.0
12	R2	6	0.0	0.013	11.5	LOS B	0.0	0.3	0.54	0.88	0.54	46.3
Approach		7	0.0	0.013	10.5	LOS B	0.0	0.3	0.52	0.81	0.52	47.1
All Vehicles		513	4.6	0.173	0.6	NA	0.0	0.3	0.01	0.05	0.01	79.6

Weekday evening peak hour – Base Scenario plus Proposed 20 lots and 50% increase in SH16 volumes

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	41	0.0	0.022	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	496	5.0	0.260	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		537	4.6	0.260	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.5
North: SH16 (North)												
8	T1	218	5.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	5	0.0	0.007	9.7	LOS A	0.0	0.2	0.51	0.66	0.51	52.0
Approach		223	4.9	0.115	0.2	NA	0.0	0.2	0.01	0.02	0.01	84.1
West: Moses Road												
10	L2	2	0.0	0.003	5.6	LOS A	0.0	0.1	0.47	0.51	0.47	52.3
12	R2	9	0.0	0.031	16.6	LOS C	0.1	0.7	0.70	0.98	0.70	42.6
Approach		12	0.0	0.031	14.6	LOS B	0.1	0.7	0.66	0.89	0.66	44.1
All Vehicles		772	4.6	0.260	0.7	NA	0.1	0.7	0.01	0.05	0.01	79.4

For both peak hour periods the predicted delay for the right turn from Moses Road increases from around 11 seconds (almost exclusively geometric and Stop delay) to up to 16 seconds with the provision of the proposed plan change in place (20 additional lots) and a 50% increase in SH16 peak hour volumes.

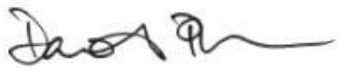
Conclusions

We consider that the intersection of SH16 and Moses Road is a suitable point of access for additional traffic movements associated with the proposed plan change to Countryside Living zone. The intersection has been constructed to a high standard within the context of the adjacent road network and the recent crash history does not highlight any notable safety concern.

Traffic generation associated with the additional 20 CL lots anticipated by the plan change can comfortably be accommodated by the intersection with no notable effect on delay for other road users, including current residents on Moses Road and Maddies Road.

We trust the above provides sufficient detail for your immediate needs. Should you wish to discuss any matter in greater detail, do not hesitate contacting the undersigned.

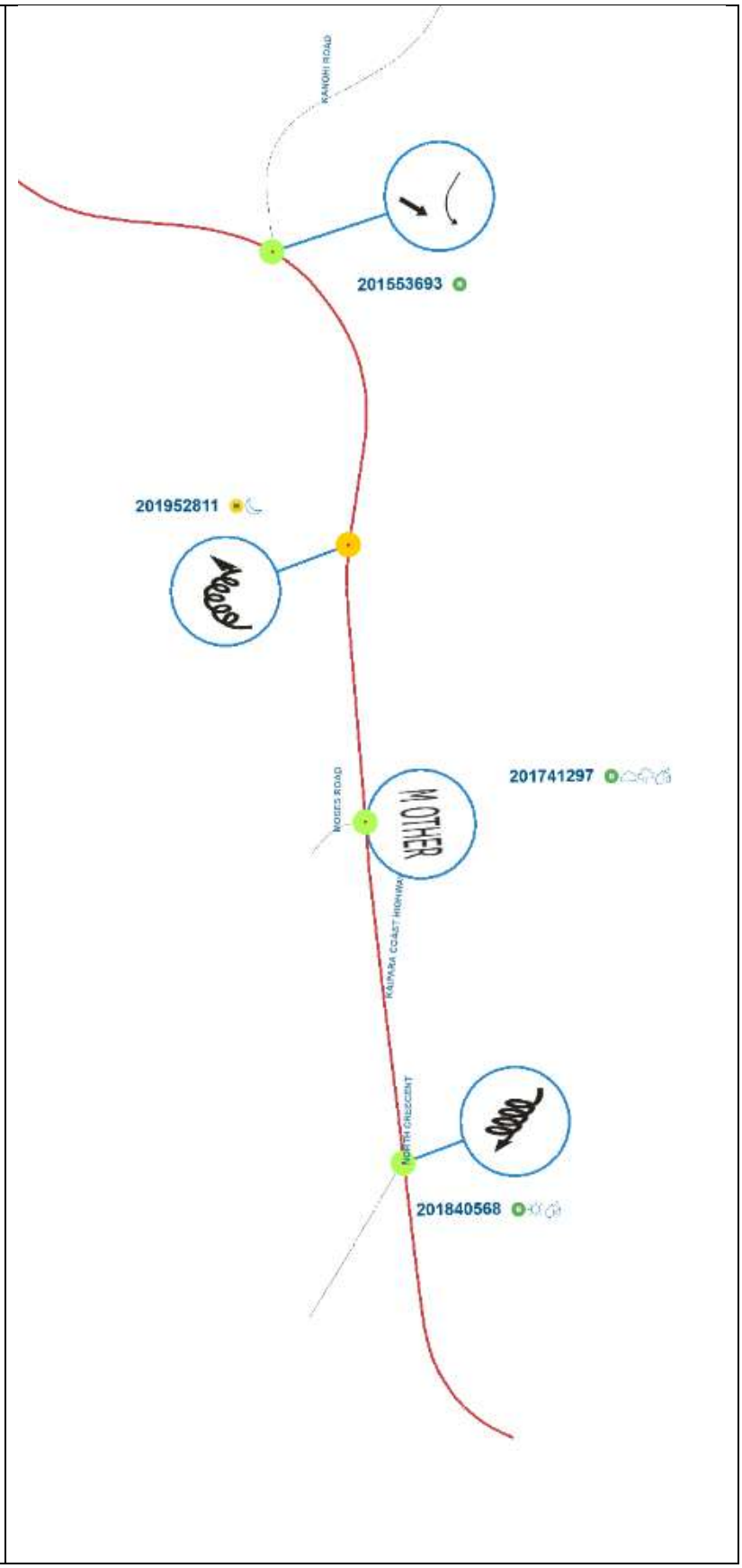
Yours faithfully
TRAFFIC ENGINEERING & MANAGEMENT LTD



David Philip

Attachment 1 – Crash listing and diagram

Crash road	*	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
016-0047		311m	N	MOSES ROAD	201952811	21/03/2019	Thu	22:15	Car/Wagon1 NDB on KAIPARA COAST HIGHWAY, KAUKAPAKAPA, AUCKLAND lost control turning right,, went off road so left, Car/Wagon1 hit tree	CAR/WAGON1, alcohol test above limit or test refused, cutting corner on bend	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	1
SH 16			I	KANOHI ROAD	201553693	22/12/2015	Tue	06:00	Car/Wagon1 SDB on SH 16 hit Van2 merging from the left	VAN2, failed to give way at priority traffic control	Dry	Twilight	Fine	T Junction	Give way	0	0	0
SH 16		238m	N	MOSES ROAD	201741297	16/02/2017	Thu	12:40	SUV1 EDB on Kaipara Coast Highway hit VEH@ manoeuvring, SUV1 hit non specific fence	SUV1, alcohol test above limit or test refused, lost control when turning, ENV: slippery road due to rain	Wet	Overcast	Light rain	Driveway	Nil	0	0	0
SH 16		130m	N	NORTH CRESCENT	201840568	26/05/2018	Sat	08:25	Car/Wagon1 SDB on KAIPARA COAST HIGHWAY, KAUKAPAKAPA, AUCKLAND lost control, went off road to right, Car/Wagon1 hit non specific fence	CAR/WAGON1, medical illness (not sudden)	Wet	Bright sun	Fine	Nil (Default)	Unknown	0	0	0



SH16 - Moses Rd Intersection

SH16 Traffic Volumes

NZTA Annual Summary Values

Region	SH	RS	RP	Site Ref	Description	AADT (2013)	AADT (2014)	AADT (2015)	AADT (2016)	AADT (2017)	AADT (2018)	% Heavy	Accepted Days	
02 - Auckland	16	47	7.16	ID:01600055	SH16 Sth of Inland Rd	3020	3068	3245	3380	3751	3882	6.9	49	
02 - Auckland	16	47	11.98	ID:01600058	SH16 Nth of Kahikatea Flat Rd	4368	4407	4643	5031	5344	5523	4.9	365	1.5km south of Moses Rd
02 - Auckland	16	47	16.12	ID:01600063	SH16 Sth of Quail Rd	2383	2460	2602	2814	3018	3132	5.5	49	2.5km north of Moses Rd
02 - Auckland	16	69	7.32	ID:01600076	SH16 Nth of West Coast Rd	1090	1150	1218	1277	1487	1688	6.9	18	

NZTA Count data 2019 - North of Kahikatea Flat Road

		adopt 85 percentile daily value	AM		PM		
			7:00 - 8:00	8:00 - 9:00	16:00 - 17:00	17:00 - 18:00	18:00 - 19:00
21/11/2019	Southbound (eastbound)	3138	328	329	189	172	142
3/05/2019	Northbound (westbound)	3222	156	181	371	393	256
	Total	**6360**	484	510	560	565	398

compared against 5,523 for 2018 AADT

Count site is to the south of Kaukapakapa and around 1.5km south of the Moses Road intersection

For 2017 - AADT 2-way volumes drop off from 5,523 to 3,132vpd from count site south of site to site 2.5km north

For assessment adopt consevative value of mean volume between two sites = 4,327vpd which is around 78% of higher site value

Adopt peak hour values of 80% of recorded 85 percentile movements

	AM	PM
EB	263	138
WB	145	314
Total	408	452

Base model flows for 2019

Attachment 3 – Summary SIDRA outputs

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road AM Existing]

SH16 Moses Road Existing AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	6	0.0	0.003	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	153	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		159	4.8	0.080	0.3	NA	0.0	0.0	0.00	0.03	0.00	79.3
North: SH16 (North)												
8	T1	277	5.0	0.145	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.26	0.56	0.26	53.8
Approach		278	5.0	0.145	0.0	NA	0.0	0.0	0.00	0.00	0.00	84.8
West: Moses Road												
10	L2	3	0.0	0.003	3.7	LOS A	0.0	0.1	0.24	0.40	0.24	53.6
12	R2	26	0.0	0.050	10.8	LOS B	0.2	1.3	0.52	0.92	0.52	46.8
Approach		29	0.0	0.050	10.1	LOS B	0.2	1.3	0.49	0.86	0.49	47.4
All Vehicles		466	4.6	0.145	0.8	NA	0.2	1.3	0.03	0.06	0.03	80.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road AM Proposed]

SH16 Moses Road AM Peak with additional 20 lots
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	9	0.0	0.005	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	153	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		162	4.7	0.080	0.4	NA	0.0	0.0	0.00	0.04	0.00	78.9
North: SH16 (North)												
8	T1	277	5.0	0.145	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	2	0.0	0.002	7.7	LOS A	0.0	0.0	0.26	0.57	0.26	53.8
Approach		279	5.0	0.145	0.1	NA	0.0	0.0	0.00	0.00	0.00	84.7
West: Moses Road												
10	L2	5	0.0	0.005	3.7	LOS A	0.0	0.1	0.24	0.41	0.24	53.6
12	R2	41	0.0	0.078	11.0	LOS B	0.3	2.0	0.53	0.94	0.53	46.7
Approach		46	0.0	0.078	10.2	LOS B	0.3	2.0	0.50	0.88	0.50	47.4
All Vehicles		487	4.4	0.145	1.1	NA	0.3	2.0	0.05	0.10	0.05	78.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road AM Proposed 20% sensitivity]

SH16 Moses Road AM Peak with additional 20 lots and added 20% on SH16
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	9	0.0	0.005	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	183	5.0	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		193	4.8	0.096	0.4	NA	0.0	0.0	0.00	0.03	0.00	79.1
North: SH16 (North)												
8	T1	333	5.0	0.174	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	2	0.0	0.002	7.8	LOS A	0.0	0.0	0.29	0.57	0.29	53.7
Approach		335	5.0	0.174	0.1	NA	0.0	0.0	0.00	0.00	0.00	84.7
West: Moses Road												
10	L2	5	0.0	0.005	3.8	LOS A	0.0	0.1	0.27	0.42	0.27	53.5
12	R2	41	0.0	0.090	12.4	LOS B	0.3	2.3	0.58	0.97	0.58	45.6
Approach		46	0.0	0.090	11.4	LOS B	0.3	2.3	0.54	0.91	0.54	46.4
All Vehicles		574	4.5	0.174	1.1	NA	0.3	2.3	0.04	0.09	0.04	79.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIC ENGINEERING & MANAGEMENT LTD | Processed: Tuesday, 11 February 2020 12:58:41 PM
Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road AM Proposed 50% sensitivity]

SH16 Moses Road AM Peak with additional 20 lots and added 50% on SH16
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	9	0.0	0.005	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	229	5.0	0.120	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		239	4.8	0.120	0.3	NA	0.0	0.0	0.00	0.02	0.00	79.3
North: SH16 (North)												
8	T1	416	5.0	0.218	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	84.9
9	R2	2	0.0	0.002	8.0	LOS A	0.0	0.0	0.33	0.57	0.33	53.5
Approach		418	5.0	0.218	0.1	NA	0.0	0.0	0.00	0.00	0.00	84.7
West: Moses Road												
10	L2	5	0.0	0.005	4.0	LOS A	0.0	0.1	0.31	0.43	0.31	53.3
12	R2	41	0.0	0.114	15.0	LOS B	0.4	2.8	0.67	1.00	0.67	43.7
Approach		46	0.0	0.114	13.7	LOS B	0.4	2.8	0.63	0.94	0.63	44.6
All Vehicles		703	4.6	0.218	1.0	NA	0.4	2.8	0.04	0.07	0.04	79.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIC ENGINEERING & MANAGEMENT LTD | Processed: Tuesday, 11 February 2020 12:58:42 PM
Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road PM Existing]

SH16 Moses Road Existing PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	26	0.0	0.014	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	331	5.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		357	4.6	0.173	0.5	NA	0.0	0.0	0.00	0.05	0.00	78.6
North: SH16 (North)												
8	T1	145	5.0	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	3	0.0	0.003	8.6	LOS A	0.0	0.1	0.41	0.60	0.41	53.1
Approach		148	4.9	0.076	0.2	NA	0.0	0.1	0.01	0.01	0.01	84.2
West: Moses Road												
10	L2	1	0.0	0.001	4.5	LOS A	0.0	0.0	0.38	0.44	0.38	53.0
12	R2	6	0.0	0.013	11.5	LOS B	0.0	0.3	0.54	0.88	0.54	46.3
Approach		7	0.0	0.013	10.5	LOS B	0.0	0.3	0.52	0.81	0.52	47.1
All Vehicles		513	4.6	0.173	0.6	NA	0.0	0.3	0.01	0.05	0.01	79.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIC ENGINEERING & MANAGEMENT LTD | Processed: Tuesday, 11 February 2020 12:42:08 PM
Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road PM Proposed]

SH16 Moses Road PM Peak with additional 20 lots
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	41	0.0	0.022	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	331	5.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		372	4.4	0.173	0.8	NA	0.0	0.0	0.00	0.07	0.00	78.0
North: SH16 (North)												
8	T1	145	5.0	0.077	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	5	0.0	0.005	8.7	LOS A	0.0	0.1	0.42	0.61	0.42	53.1
Approach		151	4.8	0.077	0.3	NA	0.0	0.1	0.01	0.02	0.01	83.7
West: Moses Road												
10	L2	2	0.0	0.002	4.5	LOS A	0.0	0.1	0.38	0.45	0.38	53.0
12	R2	9	0.0	0.020	11.6	LOS B	0.1	0.5	0.55	0.89	0.55	46.1
Approach		12	0.0	0.020	10.4	LOS B	0.1	0.5	0.52	0.81	0.52	47.3
All Vehicles		534	4.5	0.173	0.9	NA	0.1	0.5	0.02	0.07	0.02	78.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road PM Proposed 20% sensitivity]

SH16 Moses Road PM Peak with additional 20 lots and added 20% on SH16
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	41	0.0	0.022	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	397	5.0	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		438	4.5	0.208	0.7	NA	0.0	0.0	0.00	0.06	0.00	78.2
North: SH16 (North)												
8	T1	175	5.0	0.092	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	9	0.0	0.011	9.1	LOS A	0.0	0.3	0.46	0.65	0.46	52.7
Approach		184	4.7	0.092	0.5	NA	0.0	0.3	0.02	0.03	0.02	83.1
West: Moses Road												
10	L2	2	0.0	0.002	4.9	LOS A	0.0	0.1	0.42	0.47	0.42	52.8
12	R2	9	0.0	0.024	13.4	LOS B	0.1	0.6	0.61	0.92	0.61	44.8
Approach		12	0.0	0.024	11.9	LOS B	0.1	0.6	0.57	0.84	0.57	46.1
All Vehicles		634	4.5	0.208	0.8	NA	0.1	0.6	0.02	0.07	0.02	78.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8

MOVEMENT SUMMARY

Site: 102 [SH16 Moses Road PM Proposed 50% sensitivity]

SH16 Moses Road PM Peak with additional 20 lots and added 50% on SH16
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: SH16 (South)												
1	L2	41	0.0	0.022	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	60.7
2	T1	496	5.0	0.260	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		537	4.6	0.260	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.5
North: SH16 (North)												
8	T1	218	5.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	85.0
9	R2	5	0.0	0.007	9.7	LOS A	0.0	0.2	0.51	0.66	0.51	52.0
Approach		223	4.9	0.115	0.2	NA	0.0	0.2	0.01	0.02	0.01	84.1
West: Moses Road												
10	L2	2	0.0	0.003	5.6	LOS A	0.0	0.1	0.47	0.51	0.47	52.3
12	R2	9	0.0	0.031	16.6	LOS C	0.1	0.7	0.70	0.98	0.70	42.6
Approach		12	0.0	0.031	14.6	LOS B	0.1	0.7	0.66	0.89	0.66	44.1
All Vehicles		772	4.6	0.260	0.7	NA	0.1	0.7	0.01	0.05	0.01	79.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\2018_Projects\18122 - Maddies Road Plan Change\SH16 - Moses Road.sip8