APPENDIX A

Existing traffic flows on SH1

Estimated SH1 Holiday Peak Hour State Highway Traffic Volumes

Summer holiday peak hour traffic data is not available for SH1 in the vicinity of Waipu. It is therefore necessary to estimate holiday peak hour traffic volumes from the AADT estimated at this location, and the relationship between AADT and summer holiday peak hour traffic volumes for a comparable site. To assist with this assessment, WK-NZTA provided hourly directional traffic count data for the year 2019 (the last whole year pre-covid) from the two nearest continuous count stations on SH1:

- SH1 near Te Hana (Telemetry Site 17, ID: 01N00336) which is about 35km south of the site. 358 days counted.

- SH1 south of Whangarei (Nth of Maungakaramea Rd Puwera, Continuous site ID: 01N00274) which is about 29km north of the site. 202 days counted.

From the data provided, plots were generated of the average hourly two-way traffic volume for both sites by time of day and day of work. The graph for SH1 near Te Hana is shown as **Figure 1** and that for SH1 Maungakaramea as **Figure 2**.

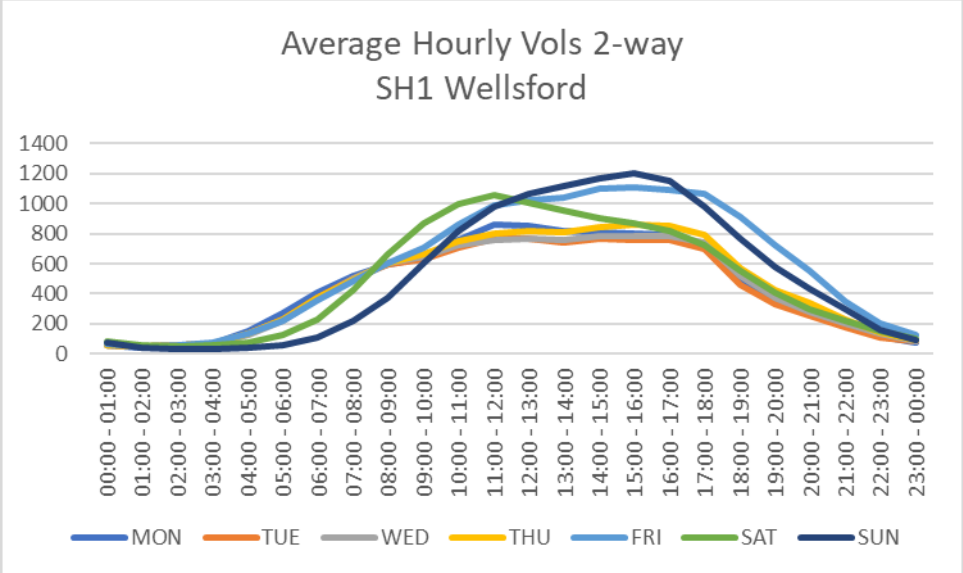


Figure 1 – Hourly two-way AADT by day of week/time of day on SH1 Te Hana.

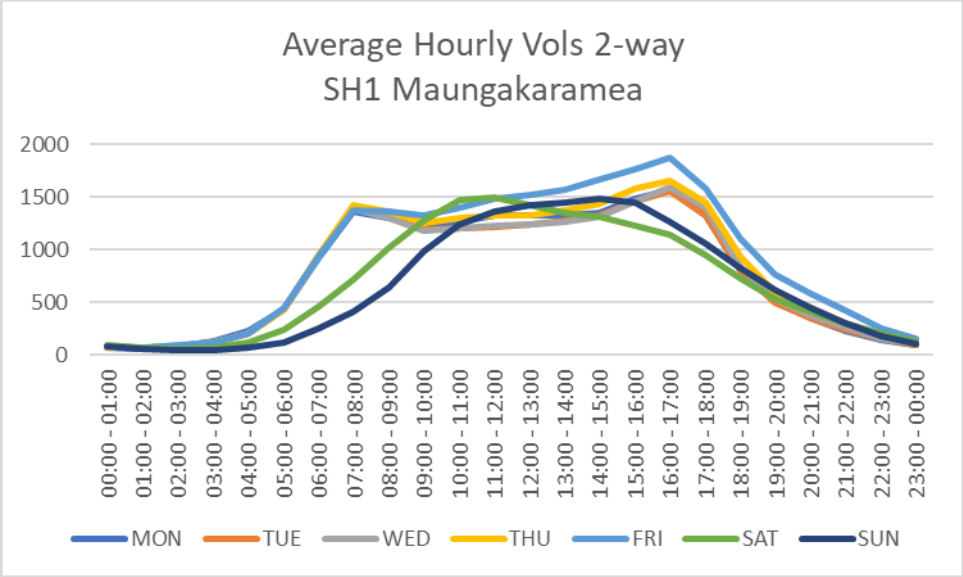


Figure 2 – Hourly two-way AADT by day of week/time of day on SH1 Maungakaramea.

The corresponding graph for SH1 near Waipu was provided by WK-NZTA and is shown in **Figure 3**.

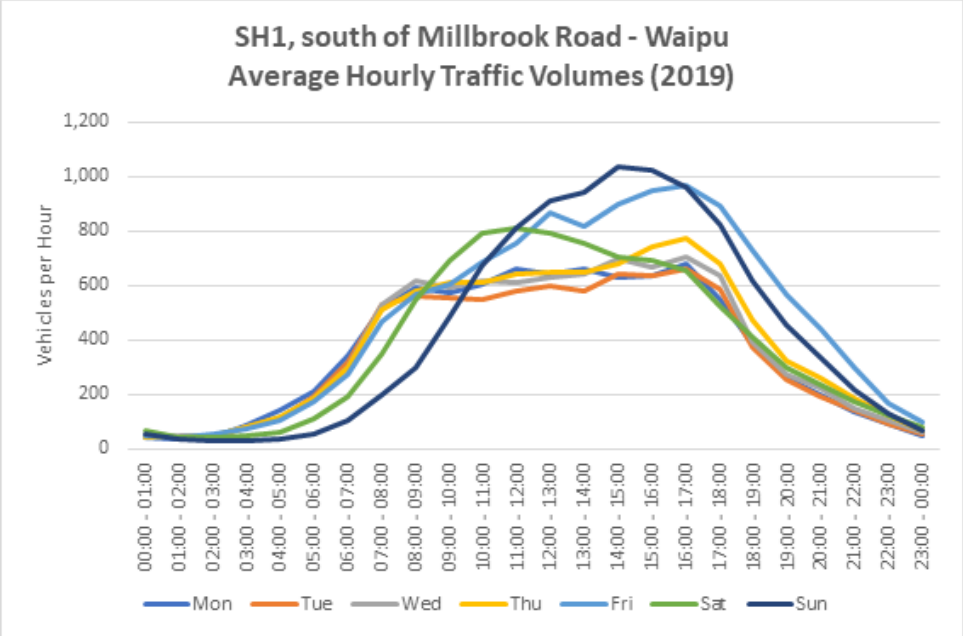


Figure 3 – Hourly two-way AADT by day of week/time of day on SH1 Waipu.

It is evident from **Figure 2** that on weekdays SH1 Maungakaramea has noticeable volume peaks in the morning and afternoon commuter peak periods. On weekends there are high levels of traffic between but excluding the AM and PM peak periods, and generally, the weekend traffic is lower than the weekday traffic. This suggests that SH1 Maungakaramea has a significant commuter traffic function.

A different pattern is evident for both the SH1 Te Hana profile in **Figure 1** and the SH1 Maungakaramea profile in **Figure 3**. Both profiles show high levels of traffic between the AM

and PM peak periods on weekdays. Weekend traffic is higher than weekday traffic, peaking mid-afternoon.

On this basis the 2019 annual hourly traffic data for SH1 Te Hana has been chosen to determine the relationship between AADT and summer holiday peak hour traffic volumes for SH1 at Waipu.

The day in 2019 with the 95th percentile (18th highest) daily traffic volume southbound on SH1 Te Hana was Sunday 17th March 2019 while the day with the 95th percentile (18th highest) daily traffic volume northbound on SH1 Te Hana was Friday 15th November 2019.

Friday 15th November 2019 was the busier day overall (14,688 vehicles per day total for both directions) but it had a lower peak hour volume (1057 vehicles per hour total in both directions from noon to 1pm). On Sunday 17th March 2019 the total two-way traffic volume was 13,805 vehicles per day but the peak hour volume was 1,397 vehicle per hour in both directions (from 2 to 3pm). The latter time also corresponded to the highest peak hour for southbound traffic (906 vehicles per hour).

The holiday peak hour was therefore chosen as Sunday 17th March 2019 from 2pm to 3pm, with a southbound volume of 906 vehicles per hour and a northbound volume of 491 vehicles per hour.

The two-way AADT for SH1 at Te Hana in 2019 was 11,438 vehicles per day. Thus, the holiday peak hour traffic volume southbound on SH1 at Te Hana in 2019 was 7.9% of the two-way AADT while the holiday peak hour traffic volume northbound on SH1 at Te Hana in 2019 was 4.3% of the two-way AADT.

The nearest SH1 count station to the proposed site in Waipu is count station ID: 01N00309 which is located about 400 metres south of Glenmohr Road and 650 metres north of Schultz Rd and is some 5 kilometres south of the site. WK-NZTA has no complete year of directional hourly traffic data available for this site, only the estimated AADT. The latest AADT available pre-covid is an AADT of 10,225 vehicles per day for 2019. Assuming that the traffic patterns on SH1 at Waipu are similar to the traffic patterns at SH1 at Te Hana, it is estimated that the 95th percentile holiday peak maximum hourly traffic volume southbound on SH1 at Waipu in 2019 was 7.9% of the two-way AADT, i.e., 810 vehicles per hour, and the holiday peak maximum hourly traffic volume northbound on SH1 at Waipu in 2019 was 4.3% of the two-way AADT, i.e., 439 vehicles per hour.

APPENDIX B

Waka Kotahi safety records: 2017-2022

Untitled query

Saved sites

21803 - BP Waipu

Crash year

2017 — 2022

Plain English report

6 results from your query.

1-6 of 6

Crash road	Side road	Feature	Distance from side road/feature	Direction	Reference station	Route position	Easting	Northing	Longitude	Latitude	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Casualty count fatal	Casualty count serious	Casualty count minor	S
SH 1	MILLBROOK ROAD		286m	S			1728689	6016506	174.427581	-35.987405	2020171171	21/11/2020	Sat	08:52	Motorcycle1 SDB on SH 1 hit rear end of Motorcycle2 stopped/moving slowly	MOTORCYCLE1, alcohol test below limit, following too closely MOTORCYLE3, alcohol test below limit, suddenly braked MOTORCYCLE2, alcohol test below limit	Dry	Bright sun	Fine	Nil (Default)	Nil	0	2	1	1
SH 1N	THE BRAIGH		240m	N			1729012	6016909	174.431091	-35.983734	201849213	30/09/2018	Sun	06:30	Car/Wagon1 SDB on Sh1 lost control; went off road to left, Car/Wagon1 hit non specific fence, non specific traffic sign	CAR/WAGON1, alcohol test below limit, fatigue due to lack of sleep	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0	0
THE BRAIGH	CABER LANE		330m	W			1729266	6016878	174.433926	-35.983976	2022230323	25/07/2022	Mon	16:30	SUV1 WDB on The Braigh lost control; went off road to right, SUV1 hit traffic sign, ditch, fence,	SUV1, alcohol suspected, drugs suspected, lost control under acceleration, too far right	Wet	Overcast	Heavy rain	Nil (Default)	Unknown	0	0	1	0
THE BRAIGH	SH 1		580m	S			1729434	6016949	174.435776	-35.983315	201899900	20/11/2018	Tue	20:30	Car/Wagon1 WDB on The braigh hit Truck2 merging from the right	TRUCK2, failed to give way entering roadway from driveway	Wet	Dark	Light rain	Driveway	Nil	0	0	0	0
THE BRAIGH	SH 1N			I			1728869	6016715	174.429535	-35.985500	201756908	31/12/2017	Sun	13:36	Van1 WDB on The braigh hit rear end of Car/Wagon2 stop/slow for cross traffic	VAN1, alcohol test below limit, following too closely CAR/WAGON2, alcohol test below limit	Dry	Overcast	Fine	T Junction	Stop	0	0	0	0
WAIPU BYPASS	THE BRAIGH		190m	N			1728983	6016867	174.430782	-35.984116	201800167	20/06/2018	Wed	08:55	SUV1 NDB on WAIPU BYPASS hit Truck2 headon on straight, SUV1 hit non specific fence, Truck2 hit non specific ditch	SUV1, alcohol test below limit, too far right TRUCK2, alcohol test below limit	Wet	Overcast	Heavy rain	Nil (Default)	Unknown	1	0	0	6

1-6 of 6

APPENDIX C

Predicted 2032 traffic flows

Traffic Growth on SH1

Figure 1 below plots the two-way AADT volumes for SH1 Waipu (count station ID: 01N00309) from 2010. It is evident that the AADT was static between 2020 and 2014, grew between 2014 and 2018, levelled out in 2019 and dropped in 2020. The drop in traffic in 2020 corresponds to Covid restrictions on travel and tourism. Tourism and travel restrictions have been lifted in 2022 but tourism numbers are only now just increasing. STATS New Zealand data indicates that there were 266,700 border crossings in April 2022, well down on the 1.2 million border crossings in April 2019, before the COVID-19 pandemic[1]. For the purposes of this assessment, it is assumed that the AADT for 2022 will be similar to the 2019 AADT.

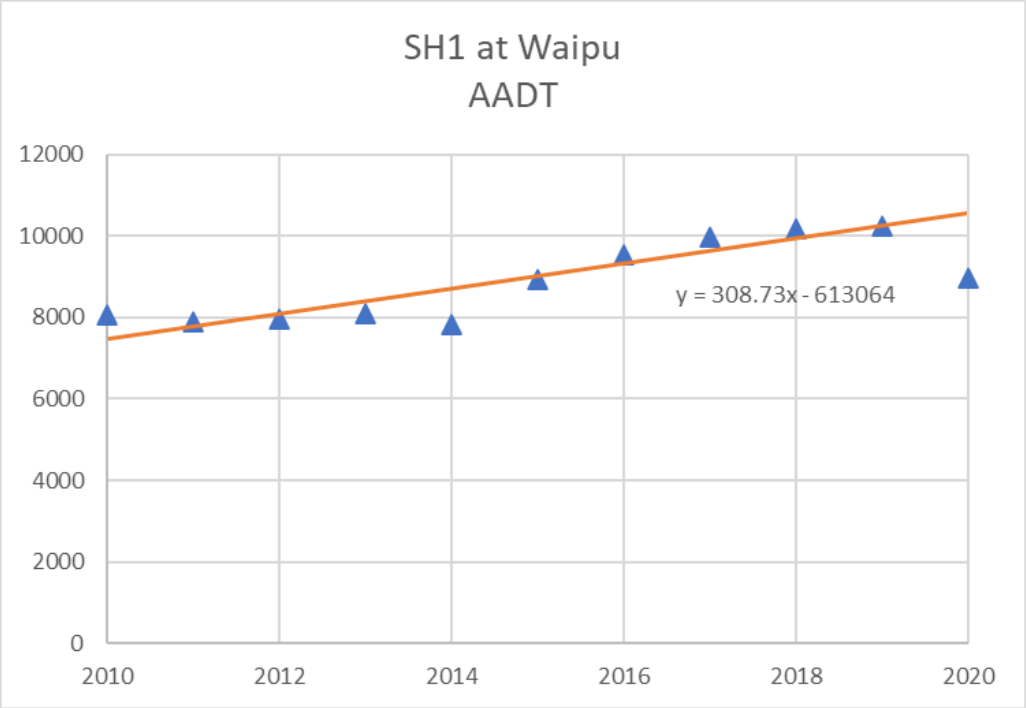


Figure 1 – Two-way AADT on SH1 Waipu

It is assumed that beyond 2022, traffic growth will continue along historic trends. Linear regression indicates that between 2010 and 2019, the AADT increase on average was 309 vpd per year, which represents 3% of the 2019 AADT.

Forecasts of future traffic growth should take into account future expectations of fuel prices and demographics. The "Transport Demand Forecasts Summary" report produced by NZIER for the Ministry of Transport (December 2013) has taken these factors into account to estimate that the net growth in light vehicle traffic in Northland will equate to less than 2% per annum.

Nevertheless, for the SIDRA analysis an AADT increase of 309 vpd per year has been used on SH1 (which represents 3% of the 2019 AADT).

[1] https://www.stats.govt.nz/news/border-crossings-highest-in-two-years/

The NZTA Planning Policy Manual indicates that for assessing development proposals, it is important to consider predicted traffic levels in the future – generally 10 years. For the purposes of this SIDRA assessment traffic growth of 309 vpd per year over 10 years (a 30% increase) has been applied to the estimated 2022 holiday peak hour traffic volumes to estimate the 2023 holiday peak hour traffic volumes.

1. 2032 Summer Holiday Peak Hour Traffic Volumes Without Development

The forecast 2032 holiday peak hour volumes on SH1 at Waipu are determined by adding the forecast 30% traffic growth to the estimated 2022 holiday peak hour volumes. The results are shown in **Table 1** below:

Table 1: Estimated 2032 Holiday Peak Hour Traffic Volume SH1 Waipu

Component	Southbound	Northbound	Total
2022 Holiday Peak Hour Traffic Volume	810	439	1249
Traffic Growth 2022 to 2031	243	132	375
TOTAL	1,053	571	1624
Percentage	65%	35%	100%

The roundabout access to the proposed service centre is to be located on SH1 in Waipu south of the Millbrook Road intersection.

The actual turning movements on SH1 at the intersections with Millbrook Road and The Braigh were counted from noon to 1pm on Wednesday 9th February 2022. The surveyed turning movements are shown in **Figure 2**.

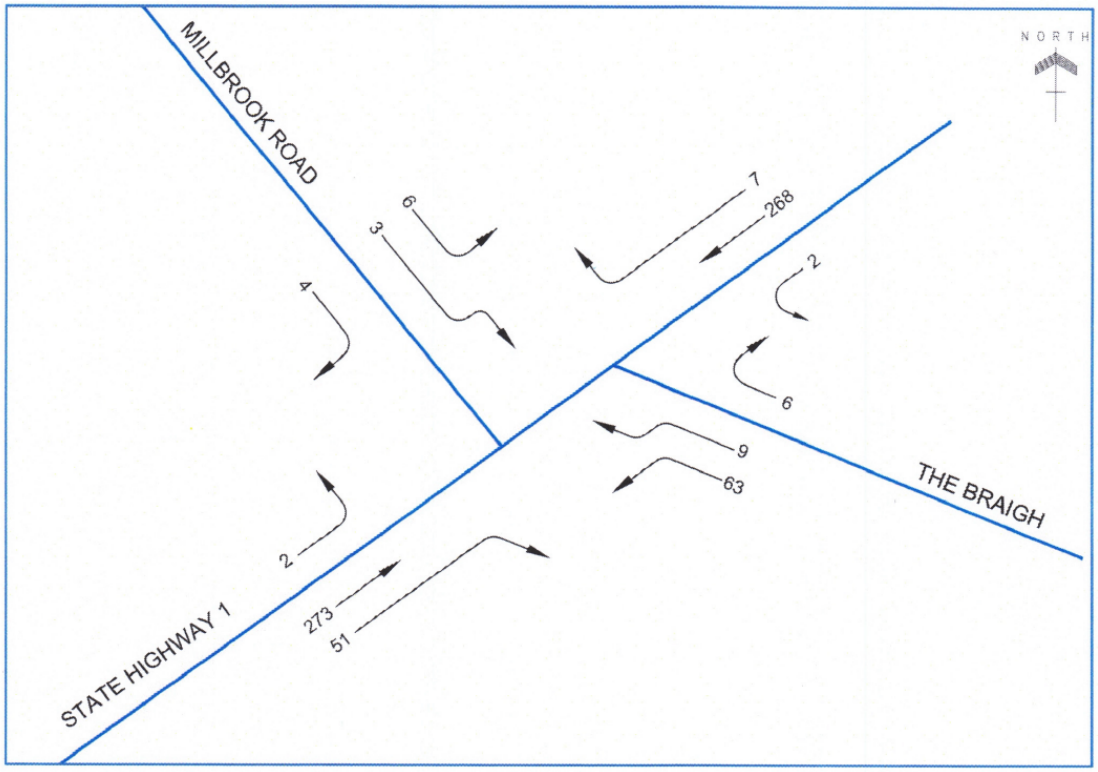


Figure 2 – Turning Movements at SH1 Waipu
12 noon to 1pm, Wednesday 9th February 2022.

The measured traffic volumes on SH1 south of the site were 335 veh/hr southbound and 326 veh/hr northbound.

At 1,053 veh/hr southbound and 571 veh/hr northbound, the estimated 2032 summer holiday peak hour volumes on SH1 are 3.14 and 1.75 times the actual southbound and northbound volumes measured in February 2022.

As Waipu is a holiday destination, it is expected that traffic volumes on The Braigh will inflate to a similar degree as on SH1 in summer peak holiday periods. However, as Millbrook Road primarily serves rural properties, it is not expected that volumes on Millbrook Road would inflate in holiday periods. On this basis, the expected 2032 holiday peak hour turning movements on SH1 at the intersections with Millbrook Road and The Braigh are shown in **Figure 3**.

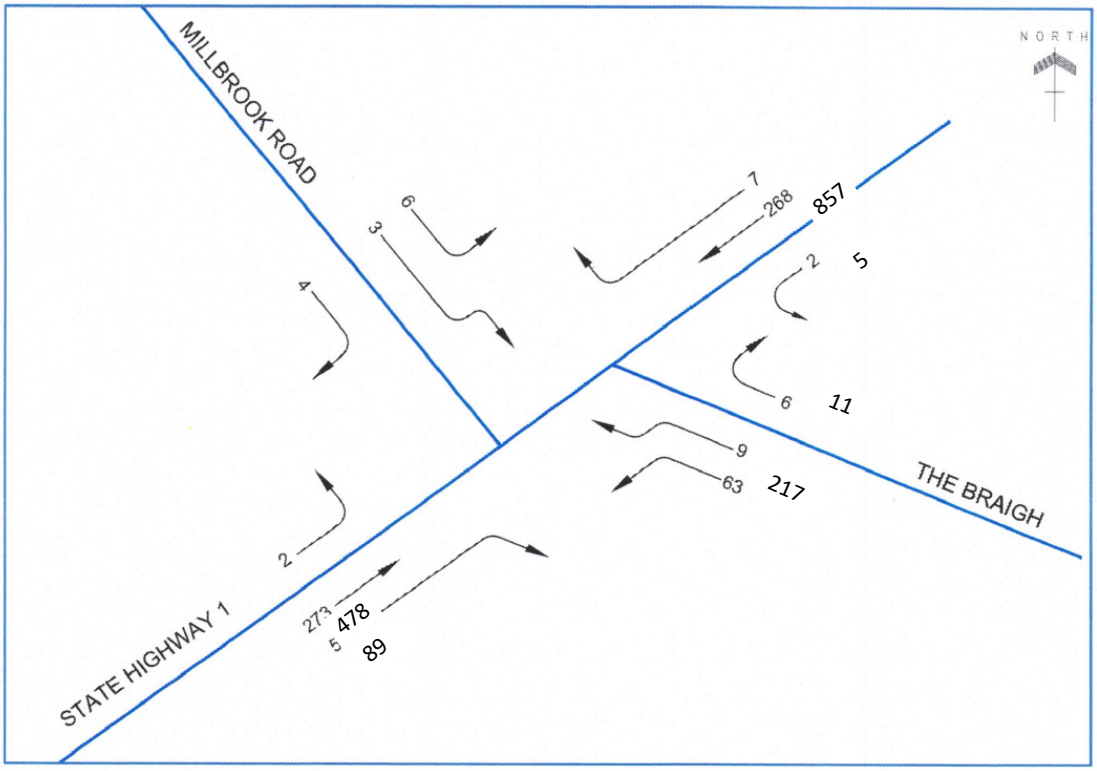


Figure 3 – Forecast 2032 Holiday Peak Turning Movements at SH1 Waipu

APPENDIX D

Millbrook Road and The Braigh intersections
SIDRA-9 model results – 2032 holiday peak hour flows

MOVEMENT SUMMARY

Site: 101 [SH1/Millbrook Road - 2032 no dev (Site Folder: 2032 Holiday Peak Base + growth on The Braigh)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: SH1 North														
25	T1	1075	12.9	1132	12.9	0.634	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.3
26	R2	16	12.9	17	12.9	0.021	10.9	LOS B	0.1	0.6	0.57	0.74	0.57	65.8
Approach		1091	12.9	1148	12.9	0.634	0.3	NA	0.1	0.6	0.01	0.01	0.01	98.5
NorthWest: Millbrook Road														
27	L2	9	12.9	9	12.9	0.293	31.9	LOS D	0.8	6.1	0.94	1.02	1.03	26.3
29	R2	4	12.9	4	12.9	0.293	243.4	LOS F	0.8	6.1	0.94	1.02	1.03	26.2
Approach		13	12.9	14	12.9	0.293	97.0	LOS F	0.8	6.1	0.94	1.02	1.03	26.3
SouthWest: SH1 south														
30	L2	2	12.9	2	12.9	0.333	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	82.0
31	T1	567	12.9	597	12.9	0.333	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach		569	12.9	599	12.9	0.333	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.6
All Vehicles		1673	12.9	1761	12.9	0.634	1.0	NA	0.8	6.1	0.01	0.02	0.01	96.8

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 No dev (Site Folder: 2032 Holiday Peak Base + growth on The Braigh)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	227	12.9	239	12.9	1.080	136.2	LOS F	21.1	163.8	1.00	2.86	6.95	17.2
23	R2	11	12.9	12	12.9	1.080	223.2	LOS F	21.1	163.8	1.00	2.86	6.95	17.1
Approach		238	12.9	251	12.9	1.080	140.2	LOS F	21.1	163.8	1.00	2.86	6.95	17.1
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.509	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	864	12.9	909	12.9	0.509	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		869	12.9	915	12.9	0.509	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.8
SouthWest: SH1 south														
31	T1	487	12.9	513	12.9	0.287	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	89	12.9	94	12.9	0.218	13.5	LOS B	0.8	6.4	0.79	0.92	0.84	41.4
Approach		576	12.9	606	12.9	0.287	2.1	NA	0.8	6.4	0.12	0.14	0.13	81.9
All Vehicles		1683	12.9	1772	12.9	1.080	20.6	NA	21.1	163.8	0.18	0.45	1.03	56.6

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 No dev - 2 lanes (Site Folder: 2032 Holiday Peak Base + growth on The Braigh)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	227	12.9	239	12.9	0.803	36.6	LOS E	5.2	40.6	0.95	1.43	2.30	33.8
23	R2	11	12.9	12	12.9	0.277	103.6	LOS F	0.8	6.0	0.97	1.02	1.04	20.7
Approach		238	12.9	251	12.9	0.803	39.7	LOS E	5.2	40.6	0.95	1.41	2.24	32.8
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.509	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	864	12.9	909	12.9	0.509	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		869	12.9	915	12.9	0.509	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.8
SouthWest: SH1 south														
31	T1	487	12.9	513	12.9	0.287	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	89	12.9	94	12.9	0.218	13.5	LOS B	0.8	6.4	0.79	0.92	0.84	41.6
Approach		576	12.9	606	12.9	0.287	2.1	NA	0.8	6.4	0.12	0.14	0.13	82.1
All Vehicles		1683	12.9	1772	12.9	0.803	6.4	NA	5.2	40.6	0.18	0.25	0.36	72.9

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX E

Proposed service centre layout

LEGEND:

1	BP SERVICE STATION BLDG	11	QSR - 1 BLDG 260m2	20	FOOD SPECIALTY STORE - 114m2	28	LOGISTICS, STORAGE, YARD, BOAT, CAR, AUTOMOTIVE SALES & SERVICES, RURAL / HOME SUPPLIES - BLDG 2,507m2
2	BP FORECOURT CANOPY	12	FOOD - 1 BLDG 148m2	20A	FOOD SPECIALTY STORE - 135m2	28A	LOADING
3	BP TRUCK STOP	13	SHOP CENTRE - 1 BLDG 408m2 (4 x 102m2 TENANCIES INDICATED)	21	QSR - 2 DRIVE THRU	29	MARINE / VEHICLE SALES & SERVICE BLDG 930m2
4	BP TRUCK PARKS	14	CAFE - 1 BLDG 113m2	22	QSR - 2 BLDG 260m2	29A	OUTDOOR DISPLAY 342m2
5	BP EV CAR PARKS	15	EV PARKS (x 4)	23	FOOD - 3 BLDG 148m2		
6	BP EV TRUCK PARKS	16	SUPERMARKET BLDG 1,000m2 + 170m2 MEZZ OR COMMERCIAL SERVICES	24	RETAIL CENTRE - 294m2 (3 x 98m2 TENANCIES INDICATED)		
7	COACH PARK	17	SUPERMARKET LOADING OR COMMERCIAL SERVICES	25	FARMING & AGRI SUPPLIES - 500m2 + 72m2 MEZZ		
8	BP AIR PARK	18	AUTOMOTIVE ASSISTANCE BLDG 296m2 OR COMMERCIAL SERVICES	26	OUTDOOR DISPLAY & STORAGE 191m2		
9	BP U/GRND TANKS & CAMPER PARKS	19	FOOD SPECIALTY STORE - 90m2	27	CAR PARKS		
10	QSR - 1 DRIVE THROUGH	19A	FOOD SPECIALTY STORE - 90m2				

OVERALL SITE AREA - 59,162 m2

BP LEASE AREA - 11,055 m2

SW — STORM WATER PONDS = 4,119m2

WW — WASTE WATER FIELDS = 5,490m2

WATER TANKS

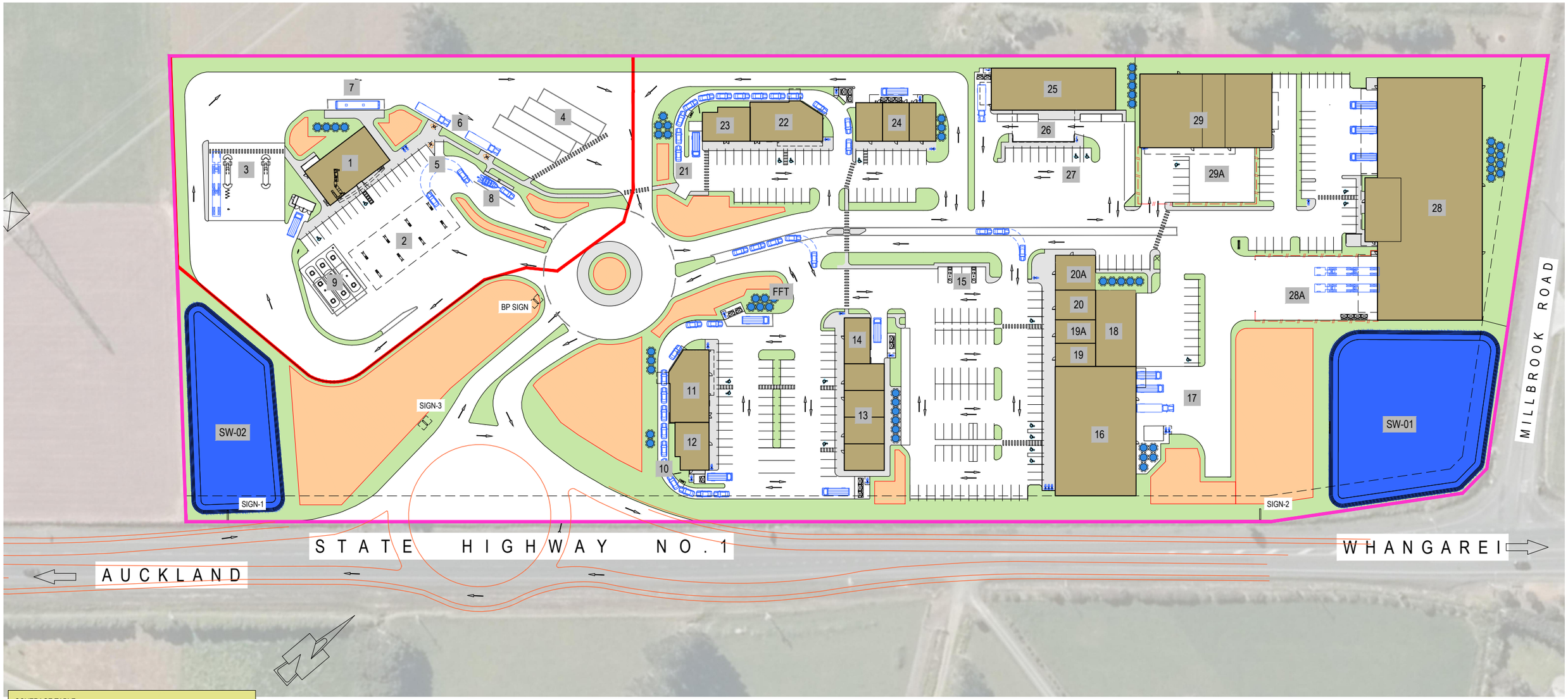
FFT — WATER TANKS - FIRE FIGHTING (FIRE ENGINEER TO CONFIRM REQUIREMENTS)

CAR PARK ASSESSMENT FOR FEASIBILITY:

BLDG:	USE:	AREA:		CAR PARKS PROVIDED
01	BP	305m2	=	17 + 1 AIR + 2 EV + 3 CAMPER PARKS 4 TRUCK PARKS 2 TRUCK EV 1 COACH PARK
11	QSR-1	260m2	=	15 + 2 GRILL PARKS
12	FOOD-1	148m2	=	9
13	SHOP CENTRE - 1	408m2	=	20
14	CAFE-1	113m2	=	6
16	SUPERMARKET	1,170m2	=	53 + 2 CAMPER PARKS
18	AUTOMOTIVE SERVICE & PARTS	296m2	=	16
19-20	SPECIALTY FOOD	430m2	=	22
NOT OTHERWISE ACCOUNTED			=	2 CAMPER PARKS + 4 EV PARKS

CAR PARK ASSESSMENT FOR FEASIBILITY:

BLDG:	USE:	AREA:		CAR PARKS PROVIDED
22	QSR-2	260m2	=	15 + 2 GRILL PARKS
23	FOOD-3	148m2	=	9
24	SHOP CENTRE - 2	294m2	=	15
25	COMMERCIAL SERVICES OUTDOOR DISPLAY	500m2 191m2	=	25 + 1 TRAILER
28	LOGISTICS, STORAGE, YARD, BOAT, CAR, AUTOMOTIVE SALES & SERVICES, RURAL / HOME SUPPLIES	2,507m2	=	27
29	BOAT, AUTOMOTIVE SALES & SERVICES BLDG 930m2 + OUTDOOR DISPLAY 342m2		=	19
TOTAL			=	266 CAR PARKS 4 GRILL PARKS 7 CAMPER PARKS 1 TRAILER PARK 6 EV PARKS 1 AIR PARK 4 TRUCK PARKS 2 TRUCK EV PARKS 1 COACH PARK



COVERAGE TABLE:

SITE AREA	=	59,162 m2
PERMITTED BUILDING COVERAGE	=	20% NET SITE
59,16 2m2 x .2	=	11,832 m2
PROPOSED BUILDING COVERAGE	=	7,605 m2
PROPOSED LANDSCAPE AREA INCL PONDS	=	20,689 m2 35 % NET SITE AREA

TECHNITRADES ARCHITECTURE
12 Ben Lomond Crescent, Pakuranga, Auckland 2010
Phone (09) 5767166 | design@technitrades.co.nz

REV.	DESCRIPTION	BY	DATE
B	SECOND ISSUE	MK	28-02-23
A	RESOURCE CONSENT	BM	10-02-23

A1 Scale.	1:600
A3 Scale.	1:1200
Designed.	L.MEIKLEJOHN
Drawn.	B.MILLWARD
A1 Plot Scale.	1 : 1
A3 Plot Scale.	1 : 2

NOTES.

DO NOT SCALE.
DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
IF IN DOUBT ON ANY ISSUE SEEK VERIFICATION PRIOR TO PROCEEDING.
READ THESE DRAWINGS IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS.

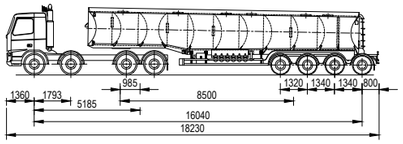
Client Reference No.
.

Project Title.
VACO INVESTMENTS LIMITED
WAIPU GATEWAY SERVICE CENTRE
47 Millbrook Road, Waipu, Whangārei District

Drawing Title.
Proposed Site Plan

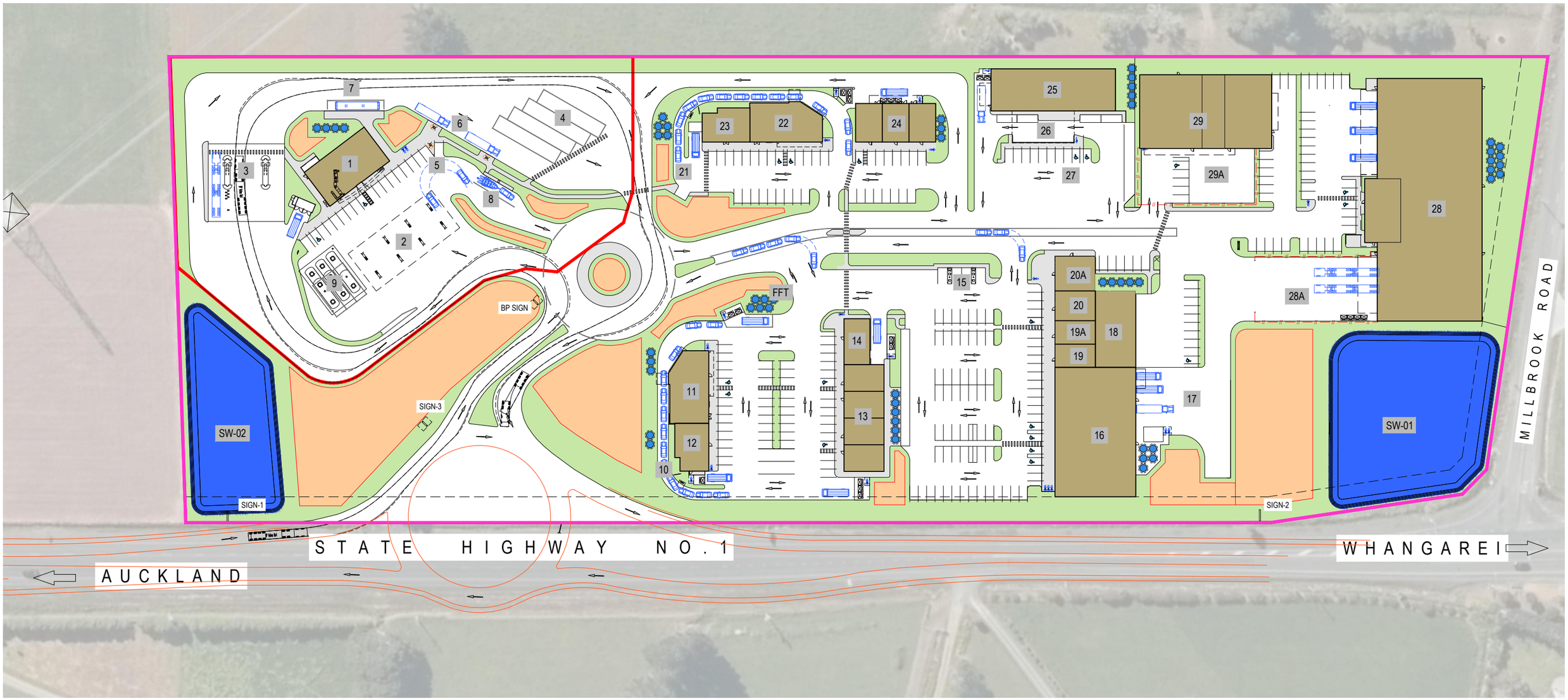
Drawing No.
. 3096-H01

Rev: B



BP VOLVO 8x4
FUEL TANKER

TRACTOR WIDTH	2500mm	TRAILER WIDTH	2500mm
TRACTOR TRACK	2500mm	TRAILER TRACK	2500mm
LOCK TO LOCK TIME	6.0 SEC	ARTICULATING ANGLE	70.0°
STEERING ANGLE	25.5°		



TECHNITRADES ARCHITECTURE
12 Ben Lomond Crescent, Pakuranga, Auckland 2010
Phone (09) 5767166 | design@technitrades.co.nz

REV.	DESCRIPTION	BY	DATE
B	SECOND ISSUE	MK	28-02-23
A	RESOURCE CONSENT	BM	10-02-23

A1 Scale.	1:600
A3 Scale.	1:1200
Designed.	L.MEIKLEJOHN
Drawn.	B.MILLWARD
A1 Plot Scale.	1 : 1
A3 Plot Scale.	1 : 2

NOTES.

DO NOT SCALE.
DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
IF IN DOUBT ON ANY ISSUE SEEK VERIFICATION PRIOR TO PROCEEDING.
READ THESE DRAWINGS IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS.

Client Reference No.
.

Project Title.
VACO INVESTMENTS LIMITED
WAIPU GATEWAY SERVICE CENTRE
47 Millbrook Road, Waipu, Whangārei District

Drawing Title.
Proposed Site Plan - with Tanker Tracking

Drawing No.
. 3096-H01-TT

Rev: B

BOUNDARY

TRUCK BY-PASS

7 - COACH PARK

BP TRUCKSTOP ISLANDS

WW-03 61m2

WATER TANKS

WW-04 80m2

1 BP SHOP

HVAC

BIKE PARKS

6 BP EV TRUCK PARKS

5 BP EV PARKS

TRUCK BY-PASS

4 BP TRUCK PARKS

8 BP AIR PARK

WW-06 68m2

WW-05 63m2

REMOTE FILLS

3 BP TRUCK STOP

VR

REFUSE

BP LOADING

TANK VENTS

2 BP CANOPY

CAMPER PARKS x 3

BP UNDERGROUND FUEL TANKS 3x100kL

TRUCKS & COACHES ONLY

BP SIGN

MOUNTABLE

WW-09 78m2

13000

20000

WW-10 214m2

FIRE FIGHTING TANKS

GRILL PARKS

STAFF BIKE STORAGE

DRIVE THRU

23 FOOD-3

22 QSR-2

24 RETAIL CENTRE

WW-07 40m2

21

WW-08 292m2

BOAT & CAMPER PARKING

15 EV PARKS

14 CAFE-1

13 SHOPPING CENTRE

11 QSR-1

12 FOOD-1

10 DRIVE THRU

CAMPER PARK

JOINING LINE

WW-11 95m2

WW-02 865m2

WW-01 2049m2

SIGN-3

SW-02 1582m2

SIGN-1

8m BLDG SETBACK

NZTA ROUNDABOUT

BOUNDARY

STATE HIGHWAY NO 1

AUCKLAND

TECHNITRADES ARCHITECTURE

12 Ben Lomond Crescent, Pakuranga, Auckland 2010
Phone (09) 5767166 | design@technitrades.co.nz

REV.	DESCRIPTION	BY	DATE
B	SECOND ISSUE	MK	28-02-23
A	RESOURCE CONSENT	BM	10-02-23

A1 Scale.	1:300
A3 Scale.	1:600
Designed.	L.MEIKLEJOHN
Drawn.	B.MILLWARD
A1 Plot Scale.	1 : 1
A3 Plot Scale.	1 : 2

NOTES.

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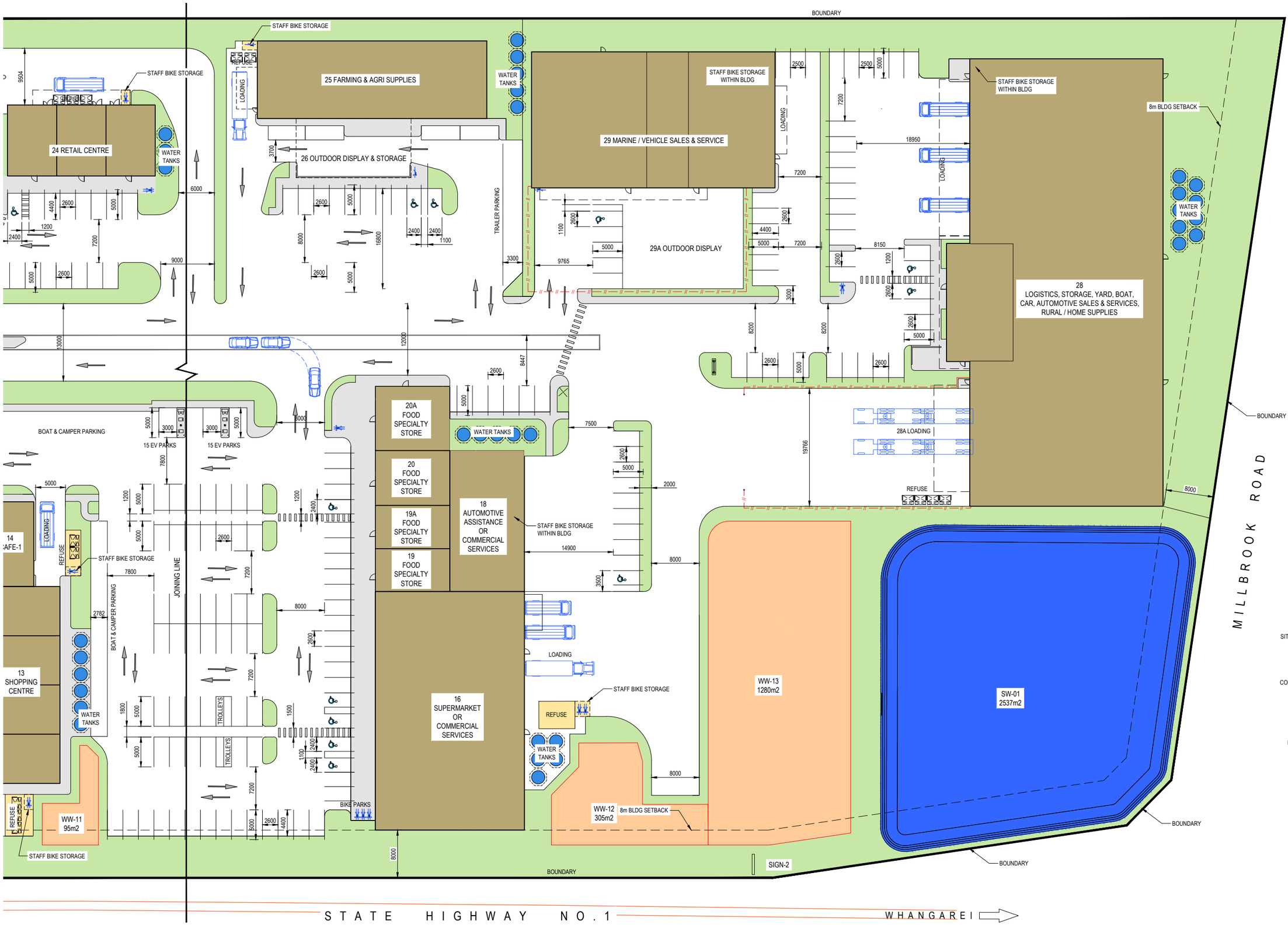
Client Reference No.
.

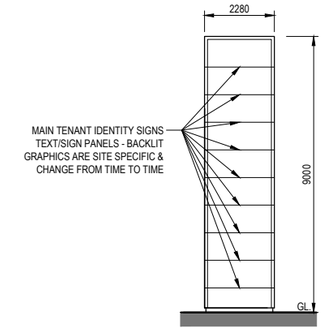
Project Title.
VACO INVESTMENTS LIMITED
WAIPU GATEWAY SERVICE CENTRE
47 Millbrook Road, Waipu, Whangārei District

Drawing Title.
Proposed Detail Site Plan - Southern

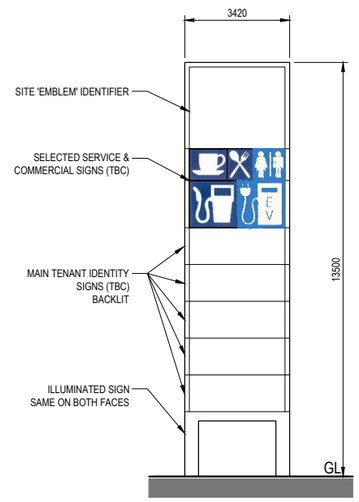
Drawing No.
. 3096-H02

Rev: B





SIGN -3
9.0m MID SIGN
SCALE 1:100 (A1) 1:200 (A3)



13.5m SITE IDENTIFIER SIGNS
(SIGNS 1 & 2 IDENTICAL)
SCALE 1:100 (A1) 1:200 (A3)

TECHNITRADES ARCHITECTURE
12 Ben Lomond Crescent, Pakuranga, Auckland 2010
Phone (09) 5767166 | design@technitrades.co.nz

REV.	DESCRIPTION	BY	DATE
B	SECOND ISSUE	MK	28-02-23
A	RESOURCE CONSENT	BM	10-02-23

A1 Scale.	1:300
A3 Scale.	1:600
Designed.	L.MEIKLEJOHN
Drawn.	B.MILLWARD
A1 Plot Scale.	1 : 1
A3 Plot Scale.	1 : 2

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Client Reference No.
.

Project Title.
VACO INVESTMENTS LIMITED
WAIPU GATEWAY SERVICE CENTRE
47 Millbrook Road, Waipu, Whangārei District

Drawing Title.
Proposed Detail Site Plan - Northern

Drawing No.
. 3096-H03

Rev: B

APPENDIX F

Typical tracking paths for a 23m HPMV truck and trailer

Rev	Revisions	By	Date

TPC TRAFFIC PLANNING CONSULTANTS LTD
Level 1, 400 Titirangi Rd, Titirangi, P.O Box 60-255, Auckland 0604
Phone: 09 817-2500 www.trafficplanning.co.nz

Project Title: BP Waipu Bypass Service Station
47 Millbrook Road, Waipu, Whangarie

Sheet Title: Vehicle Tracking - 23.0m Truck and Trailer (500mm clearance)

Designed	JB	Drawn	AM	Project No - (Sheet No)	Scales 1:750 (A3)
Checked	JB	Approved	JB	21803 - VTC - (1)	Date 12.02.23

D:\Users\Ally\Traffic Planning Dropbox\AUTOCAD Files\2021 Projects\21803 - BP Waipu Bypass Service Station\Vehicle Tracking\VTC\21803 - VTC.dwg

APPENDIX G

Trip generation and distribution predictions

Stand-Alone Peak Hour Traffic Generation of Waipu Gateway Activities

In undertaking a traffic assessment, it is common to apply published traffic generation rates to each of the separate activities on a site, and then add them to estimate the total traffic generation of the site. For another site, WK-NZTA have suggested using 85% percentile trip generation rates from NZTA Research Report 453 "Trips and Parking Related to Land Use". As this research report does not provide a trip generation rate for Automotive Servicing activities, the trip generation rate for this activity has been sourced from the US Institute of Transportation Engineers "Trip Generation" publication (6th Edition).

On this basis, the peak hour vehicle trip generation of the proposed Waipu Gateway service centre is shown in **Table 2**.

Table 2: Peak Hour Vehicle Trip Generation of Proposed Waipu Gateway Service Centre

Plan No.	Activity	GFA (m^2)	NZRR453 85th percentile trip generation rate	predicted peak vehicle movements/hour
1-9	Service station/truck stop, including EV car and truck charging stations	19 bays	20.4	388
10-11	QSR + drive-through	260	52/100m^2	135
12	Food outlet	148	5.6/100m^2	8
13	Retail tenancies	408	5.6/100m^2	23
14	Café*	113	0.5/seat	19
15	EV charging stations			
16-17	Supermarket	1000	18.9/100m^2	189
18	Automotive assistance/services**	296	7.7/100m^2	23
19-20	Food stores	429	5.6/100m^2	24
21-22	QSR + drive-through	260	52/100m^2	135
23	Food store	148	5.6/100m^2	8
24	Retail tenancies	294	5.6/100m^2	16
25-27	Farming/agricultural supplies	500	5.6/100m^2	28
28	Rural/home supplies, warehousing	2507	5.6/100m^2	140
29	Marine/vehicles sales/service	930	5.6/100m^2	52
TOTAL				1188

* Based on 50% of GFA for eating floor space and 1.5m^2 eating floor space per seat (RTA NSW) = 3m^2 GFA/seat

** ITE Trip Generation 6th Edition Land Use 840: Automotive Care Centre

Accounting for Service Centre Pass-by Trips

Pass-by trips refer to motorists who turn into and out from the site when they were already passing the site.

Data on pass-by trip rates have been sourced from the *ITE Trip Generation Handbook – 3rd Edition*, *Austroads Guide to Traffic Management (AGTM) Part 12: Traffic Impact of Developments*, and survey data on trip generation for fast food outlets undertaken for Roads and Maritime Services NSW by Bitzios Consulting. The results for relevant types of land-use are shown in **Table 3** below:

Table 3: Published Pass-by Trip Rates

Activity	Pass-by Trips (%)	Source
McDonalds	51%	Survey of 10 restaurants in NSW undertaken for Road and Maritime Services in NSW in 2016
Fast Food Outlets	35%	Undiverted drop-in: Table C8.1 of AGTM Part 12
Fast food restaurant with drive through	50%	ITE Trip Generation Handbook - 3rd Edition
Convenience Market with GAS	66%	ITE Trip Generation Handbook - 3rd Edition
Gas/service station with convenience market	56%	ITE Trip Generation Handbook - 3rd Edition
AVERAGE	52%	

These pass-by rates generally apply to urban sites, where trip distances are limited and it is not onerous to make a special (primary) trip to such activities. However, in the case of Waipu, there is a limited local population and trip distances will tend to be longer. It is thus more onerous to make a special trip to such activities. On this basis, a pass-by trip rate of 66% would appear reasonable to apply to the proposed Waipu Gateway service centre.

Accounting for Service Centre Linked Trips

Service centres comprise a number of complementary services – for example the proposed service centre will comprise a service station, fast food outlets, retail shops, cafés and an automotive service centre. In undertaking a traffic assessment, it is common to apply published traffic generation rates to each of the separate activities on a site, and then add them to estimate the total traffic generation of the site.

However, it would not be unusual for customers who are on the site to make use of more than one service, for example to have a meal or buy something while they are on the site to refuel their vehicle, and thus the total estimated traffic generation of the site should be reduced to account for this. There is, however, no published information that we could source on linked trips for service centres.

An indication of the effect of linked trips can be derived by looking at the difference between peak hour vehicle movements derived by adding the traffic generation predicted for each of the separate activities on a site with the actual measured peak hour vehicle movements.

Such a comparison was made for the BP Service Centre on SH1, Bombay. The traffic generation predicted for each of the separate activities on the site were estimated by applying the 85th percentile trip generation rates suggested by NZTA Research Report 453 to the scale of activities at the BP Bombay Service Centre. The GFAs were estimated from Auckland Council Geo Maps aerial photography and Google Maps Street View. As no counts for café seating were available, the numbers of seats in cafés in the Bombay Service Centre were estimated by assuming 50% of the GFA of cafés would be set aside for diner seating, and that (based on RTA surveys) the mean eating gross floor area per seat is 1.5m^2.

On this basis, the peak hour vehicle trip generation of the proposed activities at the BP Bombay service centre using the 85% design generation rates from NZTA Research Report 453 are shown in **Table 4**.

Table 4: Peak Hour Trip Generation of Activities at BP Bombay Service Centre

Activity	Size	Peak Hour Vehicle Trip Rate (85%)	Estimated Peak Hour Vehicle Trips
McDonalds	600m^2 GFA	52.2 veh/hr per 100m^2 GFA	313
Restaurants/cafés	384 seats	0.5 veh/hr per seat	192
Convenience Store	250m^2 GFA	18.9 veh/hr per 100m^2 GFA	47
Service Station (fuelling)	16 fuel dispensers	20.4 per bay	326
TOTAL			878

By comparison, the actual turning movements counted at this service centre in August 2016 were as shown in **Table 5**.

Table 5: Surveyed Vehicle Turning Movements at BP Bombay Service Centre

Peak Hour	Turning Movements
Weekday AM Peak Hour	456
Weekday PM Peak Hour	414
Saturday MD Peak Hour	632

By comparing the difference between the peak hour vehicle movements derived by adding the traffic generation predicted for each of the separate activities on a site with the actual measured peak hour vehicle movements, it appears that the proportion of linked trips was 48% in the AM peak hour, 53% in the PM peak hour and 28% in the midday Saturday peak hour.

For the purposes of this assessment, it is conservatively assumed that 50% of trips to the proposed service centre will be linked trips.

Pass-by Trip Turning Movements

Accounting for linked trips, the predicted holiday peak hour trip generation of the service centre is 487 vehicle movements per hour. As indicated above, 66% of vehicle movements are expected to be associated with pass-by trips, meaning pass-by trips in the holiday peak hour are expected to generate 321 vehicle movements per hour. It is assumed that the direction of pass-by trips will be in proportion to the holiday peak hour traffic volume by direction, i.e., 65% southbound and 35% northbound. Thus 208 vehicle movements per hour will be associated with southbound pass-by trips and 113 vehicle movements per hour will be associated with northbound pass-by trips. Finally, it is assumed that the pass-by vehicle movements will be equally split between vehicles entering the service centre and vehicles leaving the service centre. On this basis, the expected holiday peak hour pass-by vehicle movements associated with the proposed service centre are shown in **Table 6**.

Table 6: Predicted Holiday Peak Hour Pass-By Vehicle Movements

Direction	Northbound	Southbound
In	56	104
Out	56	104
TOTAL	112	208

These trips are not additional traffic, and so the volume of through traffic on SH1 needs to be reduced by the corresponding amount, i.e., 56 vehicles per hour northbound and 104 vehicles per hour southbound.

Primary Trip Vehicle Movements

Primary trips are special trips made solely for the purpose of visiting the service centre. It is predicted that 34% of the total vehicle movements associated with the service centre will be associated with primary trips, i.e., 166 vehicle movements in the holiday peak hour.

It is assumed that primary trips will originate equally between origins to the north of Waipu, origins to the south of Waipu, and origins within Waipu, i.e., 55 vehicle movements associated with each of these origins. It is once again expected that primary vehicle movements will be equally split between vehicles entering and leaving the service centre.

Customers from areas to the south will approach the site northbound on SH1 and leave the site southbound on SH1, customers from areas to the north will approach the site southbound on SH1 and leave the site northbound on SH1, and customers from Waipu will access the site via The Braigh and return the same way.

On this basis, the expected holiday peak hour primary vehicle movements generated by the proposed service centre are shown in **Figure 1**.

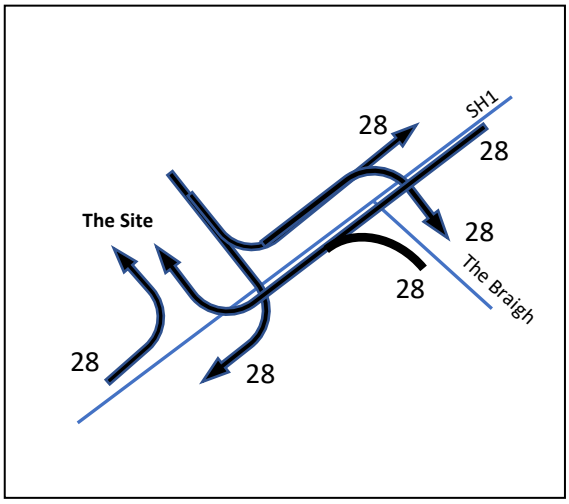
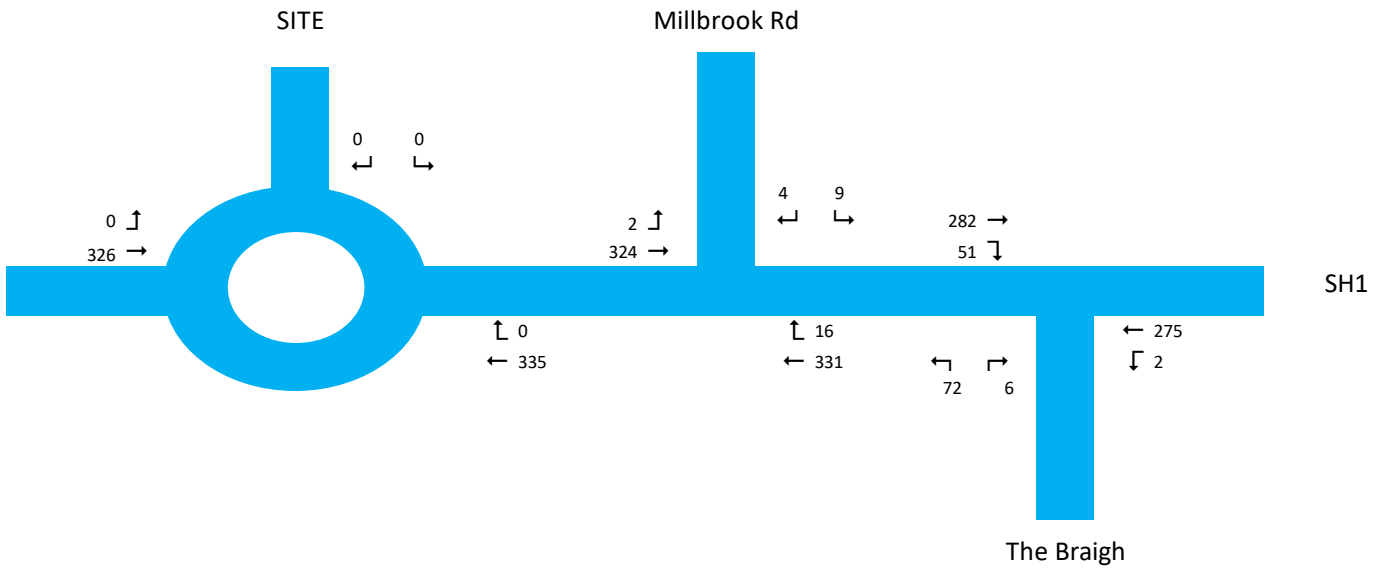


Figure 1 – Holiday Peak Hour Service Centre Primary Turning Movements

These turning movements are additional traffic movements and need to be added to the 2032 holiday peak hour turning movement volumes.

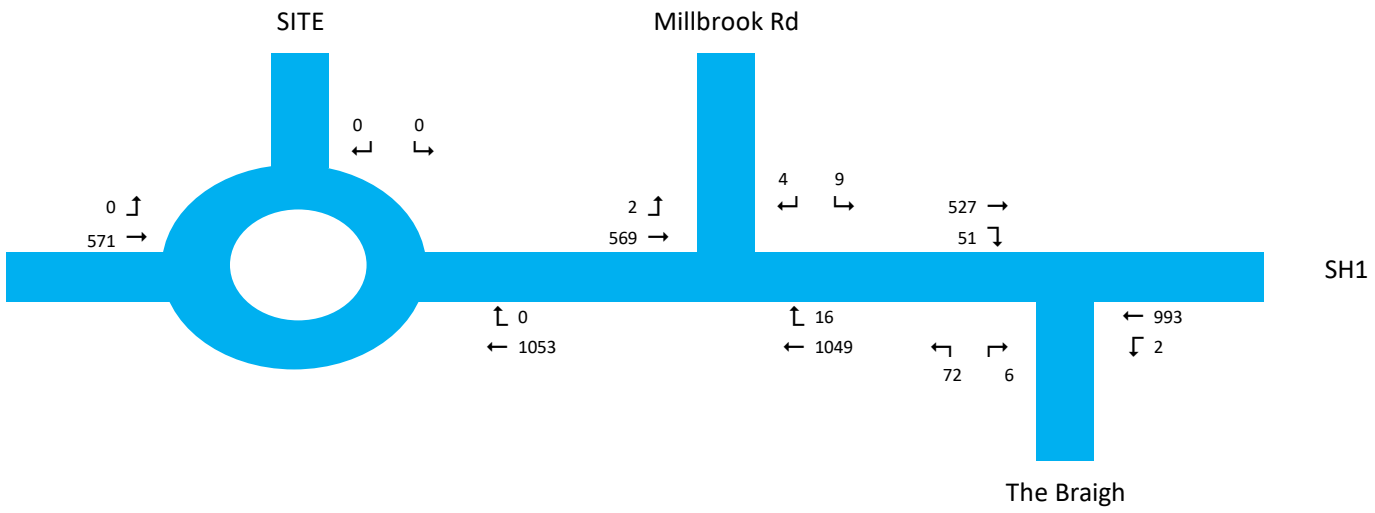
BP Waipu

COUNTED TURNING MOVEMENTS 12NOON TO 1PM, WED 9TH FEB 2022



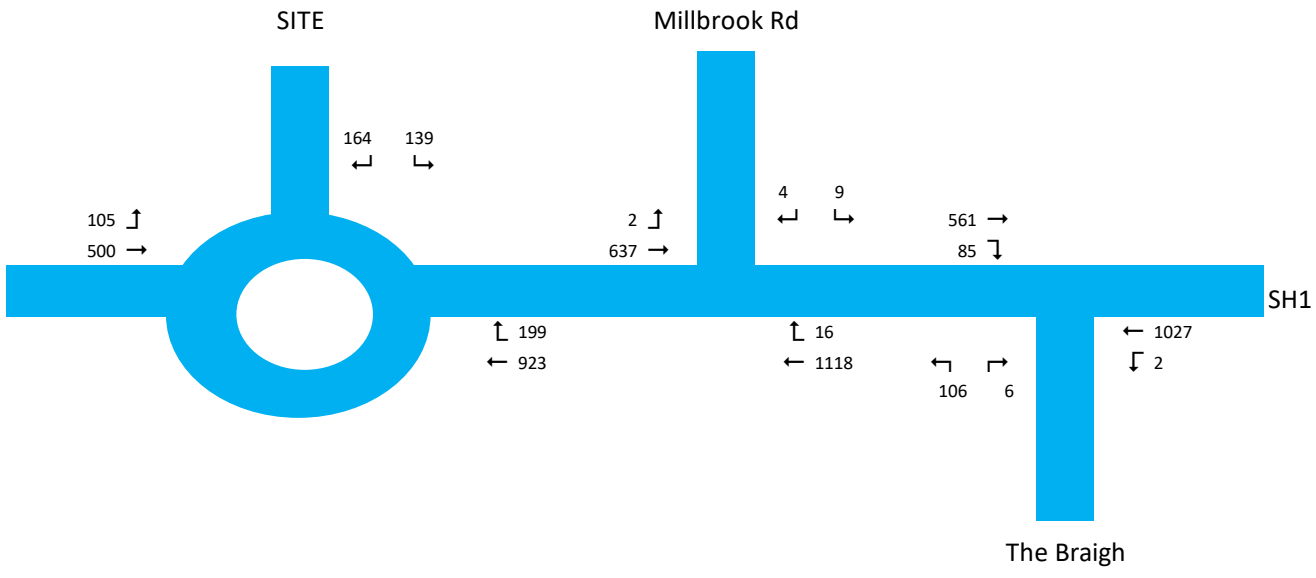
	NBD	SBD	TOTAL
SH1 WELLSFORD HOLIDAY PEAK HOUR	491	906	
SH1 WELLSFORD AADT	11438		
AADT→HOLDAY PEAK FACTOR	4.3%	7.9%	
SH1 WAIPU AADT	10225		
SH1 WAIPU HOLIDAY PEAK HOUR	439	809.9	
SH1 INCREASE 2022-2032	30%		
2032 SH1 WAIPU HOLIDAY PEAK HOUR	571	1053	1624
PERCENT	35%	65%	
	NBD	SBD	

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS (EXCL DEVELOPMENT TRAFFIC)



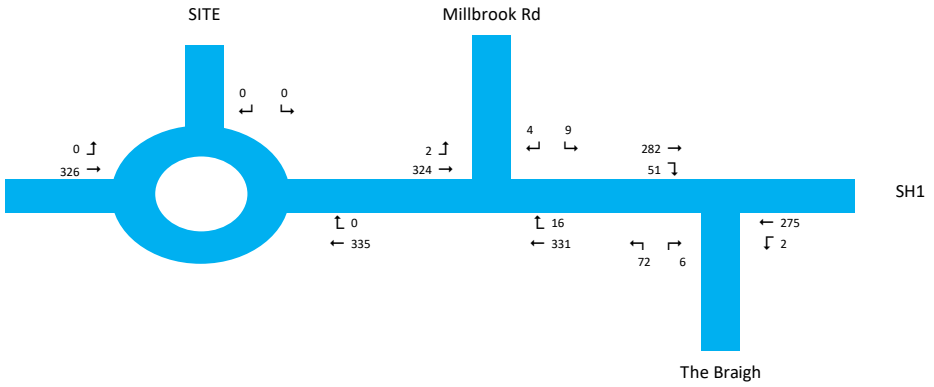
	NBD	SBD	TOTAL
WAIPU GATEWAY RAW PEAK HOUR TRIP GEN			1213
PERCENT LINKED TRIPS			**50%**
WAIPU GATEWAY HOLIDAY PEAK HOUR TRIP GEN			606.5
PERCENT PASS-BY TRIPS			**66%**
TOTAL PASS-BY VEH MOVEMENTS			400
PERCENT PASS-BY BY DIRECTION	35%	65%	
PASS-BY MOVEMENTS BY DIRECTION	141	260	
%IN	50%	50%	
PASS-BY IN MOVEMENTS BY DIRECTION	70	130	
PASS-BY OUT MOVEMENTS BY DIRECTION	70	130	
PERCENT PRIMARY TRIPS			34%
TOTAL PRIMARY VEH MOVEMENTS			206
SPLIT BETWEEN SH1 NBD, SH1 SBD AND WAIPU			33%
NUMBER OF PRIMARY MOVEMENTS PER ORIGIN			69
%IN			50%
PRIMARY IN MOVEMENTS PER ORIGIN			34
PRIMARY OUT MOVEMENTS PER ORIGIN			34

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS INCLUDING DEVELOPMENT TRAFFIC



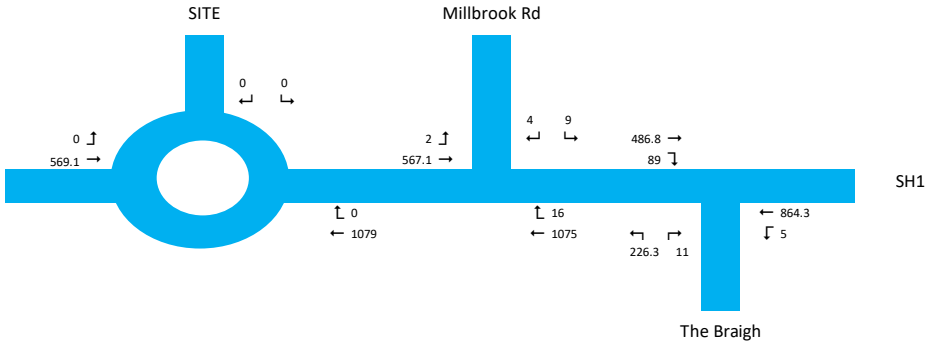
BP Waipu

COUNTED TURNING MOVEMENTS 12NOON TO 1PM, WED 9TH FEB 2022



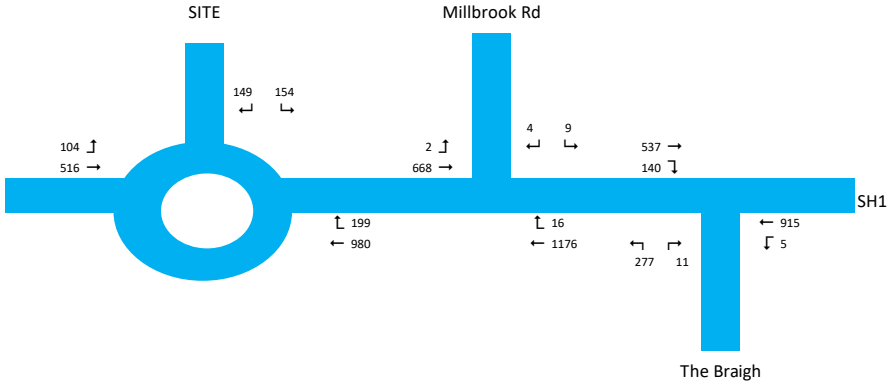
	NBD	SBD	TOTAL
SH1 WELLSFORD HOLIDAY PEAK HOUR	491	906	
SH1 WELLSFORD AADT	11438		
AADT→HOLDAY PEAK FACTOR	4.3%	7.9%	
SH1 WAIPU AADT	10225		
SH1 WAIPU HOLIDAY PEAK HOUR	439	809.9	
SH1 INCREASE 2022-2032	30%		
2032 SH1 WAIPU HOLIDAY PEAK HOUR	571	1053	1624
PERCENT	35%	65%	
2022 SH1 WAIPU NOON-1PM	326	335	
2022 SH1 WAIPU NOON→2032 HDAY PEAK FACTOR	1.7503	3.14	
	NBD	SBD	

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS (EXCL DEVELOPMENT TRAFFIC)



	NBD	SBD	TOTAL
WAIPU GATEWAY RAW PEAK HOUR TRIP GEN			1213
PERCENT LINKED TRIPS			**50%**
WAIPU GATEWAY HOLIDAY PEAK HOUR TRIP GEN			607
PERCENT PASS-BY TRIPS			**50%**
TOTAL PASS-BY VEH MOVEMENTS			303
PERCENT PASS-BY BY DIRECTION	35%	65%	
PASS-BY MOVEMENTS BY DIRECTION	107	197	
%IN	50%	50%	
PASS-BY IN MOVEMENTS BY DIRECTION	53	98	
PASS-BY OUT MOVEMENTS BY DIRECTION	53	98	
PERCENT PRIMARY TRIPS			50%
TOTAL PRIMARY VEH MOVEMENTS			303
SPLIT BETWEEN SH1 NBD, SH1 SBD AND WAIPU			33%
NUMBER OF PRIMARY MOVEMENTS PER ORIGIN			101
%IN			50%
PRIMARY IN MOVEMENTS PER ORIGIN			51
PRIMARY OUT MOVEMENTS PER ORIGIN			51

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS INCLUDING DEVELOPMENT TRAFFIC



APPENDIX H

SIDRA-9 model results – 2032 holiday peak with Service Centre

- *Service Centre roundabout*
- *Millbrook Road/The Braigh intersections*

MOVEMENT SUMMARY

Site: 101 [Service Centre roundabout (Site Folder: Option DDH - roundabout 1213 gen)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: SH1 north														
25	T1	949	12.9	999	12.9	0.902	12.9	LOS B	22.0	170.7	1.00	0.73	1.16	67.1
26	R2	199	12.9	209	12.9	0.902	20.4	LOS C	22.0	170.7	1.00	0.73	1.16	53.2
Approach		1148	12.9	1208	12.9	0.902	14.2	LOS B	22.0	170.7	1.00	0.73	1.16	64.2
NorthWest: site access														
27	L2	139	12.9	146	12.9	0.354	3.6	LOS A	2.5	19.7	0.75	0.72	0.75	47.2
29	R2	164	12.9	173	12.9	0.354	8.1	LOS A	2.5	19.7	0.75	0.72	0.75	48.3
Approach		303	12.9	319	12.9	0.354	6.0	LOS A	2.5	19.7	0.75	0.72	0.75	47.8
SouthWest: SH1 south														
30	L2	105	12.9	111	12.9	0.509	8.1	LOS A	4.6	35.8	0.63	0.61	0.63	51.2
31	T1	499	12.9	525	12.9	0.509	8.5	LOS A	4.6	35.8	0.63	0.61	0.63	71.8
Approach		604	12.9	636	12.9	0.509	8.4	LOS A	4.6	35.8	0.63	0.61	0.63	67.1
All Vehicles		2055	12.9	2163	12.9	0.902	11.3	LOS B	22.0	170.7	0.85	0.70	0.94	61.8

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

MOVEMENT SUMMARY

Site: 101 [SH1/Millbrook Road - 2032 with dev (Site Folder: Option DDH - roundabout 1213 gen)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: SH1 North														
25	T1	1143	12.9	1203	12.9	0.674	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	99.1
26	R2	16	12.9	17	12.9	0.024	11.6	LOS B	0.1	0.7	0.60	0.77	0.60	65.0
Approach		1159	12.9	1220	12.9	0.674	0.3	NA	0.1	0.7	0.01	0.01	0.01	98.4
NorthWest: Millbrook Road														
27	L2	9	12.9	9	12.9	0.522	113.8	LOS F	1.4	11.1	0.97	1.04	1.18	13.5
29	R2	4	12.9	4	12.9	0.522	489.2	LOS F	1.4	11.1	0.97	1.04	1.18	13.4
Approach		13	12.9	14	12.9	0.522	229.3	LOS F	1.4	11.1	0.97	1.04	1.18	13.5
SouthWest: SH1 south														
30	L2	2	12.9	2	12.9	0.373	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	82.0
31	T1	636	12.9	669	12.9	0.373	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach		638	12.9	672	12.9	0.373	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.6
All Vehicles		1810	12.9	1905	12.9	0.674	1.9	NA	1.4	11.1	0.01	0.02	0.01	94.5

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 with dev (Site Folder: Option DDH - roundabout 1213 gen)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	261	12.9	275	12.9	1.404	400.5	LOS F	58.2	452.5	1.00	5.05	14.19	7.6
23	R2	11	12.9	12	12.9	1.404	490.7	LOS F	58.2	452.5	1.00	5.05	14.19	7.6
Approach		272	12.9	286	12.9	1.404	404.1	LOS F	58.2	452.5	1.00	5.05	14.19	7.6
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.529	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	899	12.9	946	12.9	0.529	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		904	12.9	952	12.9	0.529	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.7
SouthWest: SH1 south														
31	T1	521	12.9	548	12.9	0.307	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	124	12.9	131	12.9	0.333	15.9	LOS C	1.4	10.7	0.83	0.99	1.02	40.3
Approach		645	12.9	679	12.9	0.333	3.1	NA	1.4	10.7	0.16	0.19	0.20	77.7
All Vehicles		1821	12.9	1917	12.9	1.404	61.5	NA	58.2	452.5	0.21	0.82	2.19	34.1

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 with dev - 2-lanes (Site Folder: Option DDH - roundabout 1213 gen)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	261	12.9	275	12.9	1.023	96.9	LOS F	16.2	126.1	1.00	2.46	5.74	21.7
23	R2	11	12.9	12	12.9	0.380	152.8	LOS F	1.1	8.2	0.98	1.03	1.08	16.2
Approach		272	12.9	286	12.9	1.023	99.2	LOS F	16.2	126.1	1.00	2.41	5.55	21.4
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.529	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	899	12.9	946	12.9	0.529	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		904	12.9	952	12.9	0.529	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.7
SouthWest: SH1 south														
31	T1	521	12.9	548	12.9	0.307	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	124	12.9	131	12.9	0.333	15.9	LOS C	1.4	10.7	0.83	0.98	1.02	40.5
Approach		645	12.9	679	12.9	0.333	3.1	NA	1.4	10.7	0.16	0.19	0.20	77.9
All Vehicles		1821	12.9	1917	12.9	1.023	16.0	NA	16.2	126.1	0.21	0.43	0.90	60.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX I

Sensitivity test for pass-by traffic percentage
SIDRA-9 model results – 2032 holiday peak with service centre

- *Service Centre roundabout*
- *Millbrook Road/The Braigh intersections*

MOVEMENT SUMMARY

Site: 101 [Service Centre roundabout (Site Folder: Option DDH - roundabout 1213 gen - 50% pb)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: SH1 north														
25	T1	980	12.9	1032	12.9	0.910	12.4	LOS B	23.0	178.5	1.00	0.70	1.13	67.2
26	R2	199	12.9	209	12.9	0.910	19.9	LOS B	23.0	178.5	1.00	0.70	1.13	53.3
Approach		1179	12.9	1241	12.9	0.910	13.7	LOS B	23.0	178.5	1.00	0.70	1.13	64.3
NorthWest: site access														
27	L2	154	12.9	162	12.9	0.361	3.8	LOS A	2.6	20.3	0.77	0.73	0.77	47.3
29	R2	149	12.9	157	12.9	0.361	8.3	LOS A	2.6	20.3	0.77	0.73	0.77	48.4
Approach		303	12.9	319	12.9	0.361	6.0	LOS A	2.6	20.3	0.77	0.73	0.77	47.8
SouthWest: SH1 south														
30	L2	104	12.9	109	12.9	0.523	8.2	LOS A	4.8	37.3	0.64	0.61	0.64	51.1
31	T1	516	12.9	543	12.9	0.523	8.5	LOS A	4.8	37.3	0.64	0.61	0.64	71.7
Approach		620	12.9	653	12.9	0.523	8.5	LOS A	4.8	37.3	0.64	0.61	0.64	67.2
All Vehicles		2102	12.9	2213	12.9	0.910	11.0	LOS B	23.0	178.5	0.86	0.68	0.93	62.0

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

MOVEMENT SUMMARY

Site: 101 [SH1/Millbrook Road - 2032 with dev (Site Folder: Option DDH - roundabout 1213 gen - 50% pb)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: SH1 North														
25	T1	1176	12.9	1238	12.9	0.694	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	99.1
26	R2	16	12.9	17	12.9	0.025	12.0	LOS B	0.1	0.7	0.61	0.78	0.61	64.5
Approach		1192	12.9	1255	12.9	0.694	0.3	NA	0.1	0.7	0.01	0.01	0.01	98.3
NorthWest: Millbrook Road														
27	L2	9	12.9	9	12.9	0.704	226.1	LOS F	2.0	15.7	0.98	1.06	1.31	8.6
29	R2	4	12.9	4	12.9	0.704	730.0	LOS F	2.0	15.7	0.98	1.06	1.31	8.6
Approach		13	12.9	14	12.9	0.704	381.1	LOS F	2.0	15.7	0.98	1.06	1.31	8.6
SouthWest: SH1 south														
30	L2	2	12.9	2	12.9	0.392	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	82.0
31	T1	668	12.9	703	12.9	0.392	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach		670	12.9	705	12.9	0.392	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.6
All Vehicles		1875	12.9	1974	12.9	0.704	2.9	NA	2.0	15.7	0.01	0.01	0.01	92.1

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 with dev (Site Folder: Option DDH - roundabout 1213 gen - 50% pb)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	277	12.9	292	12.9	1.583	558.0	LOS F	76.5	594.9	1.00	5.80	16.76	5.7
23	R2	11	12.9	12	12.9	1.583	650.1	LOS F	76.5	594.9	1.00	5.80	16.76	5.7
Approach		288	12.9	303	12.9	1.583	561.5	LOS F	76.5	594.9	1.00	5.80	16.76	5.7
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.538	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	915	12.9	963	12.9	0.538	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		920	12.9	968	12.9	0.538	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.7
SouthWest: SH1 south														
31	T1	537	12.9	565	12.9	0.316	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	140	12.9	147	12.9	0.392	17.2	LOS C	1.7	13.1	0.85	1.02	1.11	39.7
Approach		677	12.9	713	12.9	0.392	3.6	NA	1.7	13.1	0.18	0.21	0.23	76.0
All Vehicles		1885	12.9	1984	12.9	1.583	87.2	NA	76.5	594.9	0.22	0.96	2.64	27.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 with dev - 2-lanes - Copy (Site Folder: Option DDH - roundabout 1213 gen - 50% pb)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: The Braigh														
21	L2	277	12.9	292	12.9	1.141	177.5	LOS F	30.8	239.6	1.00	3.48	9.08	14.6
23	R2	11	12.9	12	12.9	0.442	187.3	LOS F	1.2	9.5	0.99	1.03	1.11	14.0
Approach		288	12.9	303	12.9	1.141	177.9	LOS F	30.8	239.6	1.00	3.38	8.78	14.5
NorthEast: SH1 north														
24	L2	5	12.9	5	12.9	0.538	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.6
25	T1	915	12.9	963	12.9	0.538	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	98.9
Approach		920	12.9	968	12.9	0.538	0.1	NA	0.0	0.0	0.00	0.00	0.00	98.7
SouthWest: SH1 south														
31	T1	537	12.9	565	12.9	0.316	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	140	12.9	147	12.9	0.392	17.2	LOS C	1.7	13.1	0.85	1.01	1.11	39.9
Approach		677	12.9	713	12.9	0.392	3.6	NA	1.7	13.1	0.18	0.21	0.23	76.1
All Vehicles		1885	12.9	1984	12.9	1.141	28.5	NA	30.8	239.6	0.22	0.59	1.42	49.5

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.