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1 NFAP Indicative Recommended Option BCR

Assumptions	
Discount R	4%

			Do Minimum											
	Year	DF	TT	Discounted	VOC	Discounted	CO2	Discounted	Crash Cost	Discounted	Bus TT	Discounted		
	2018		\$ 126,853,176.76		\$ 103,866,241		\$ 6,426,490		\$ 14,583,200		\$ 1,424,406.46			
	2019		\$ 131,077,330		\$ 106,414,802		\$ 6,584,176		\$ 14,774,297		\$ 1,445,158			
0	2020	1	\$ 135,301,483	\$ 135,301,483	\$ 108,963,362	\$ 108,963,362	\$ 6,741,862	\$ 6,741,862	\$ 14,965,394	\$ 14,965,394	\$ 1,465,909	\$ 1,465,909	\$	1,465,909
1	2021	0.961538	\$ 139,525,636	\$ 134,159,265	\$ 111,511,923	\$ 107,223,003	\$ 6,899,549	\$ 6,634,182	\$ 15,156,490	\$ 14,573,549	\$ 1,486,660	\$ 1,486,660	\$	1,429,481
2	2022	0.924556	\$ 143,749,789	\$ 132,904,761	\$ 114,060,483	\$ 105,455,329	\$ 7,057,235	\$ 6,524,811	\$ 15,347,587	\$ 14,189,707	\$ 1,507,411	\$ 1,507,411	\$	1,393,686
3	2023	0.888996	\$ 147,973,942	\$ 131,548,296	\$ 116,609,044	\$ 103,665,015	\$ 7,214,922	\$ 6,414,039	\$ 15,538,684	\$ 13,813,834	\$ 1,528,162	\$ 1,528,162	\$	1,358,531
4	2024	0.854804	\$ 152,198,095	\$ 130,099,570	\$ 119,157,604	\$ 101,856,420	\$ 7,372,608	\$ 6,302,136	\$ 15,729,781	\$ 13,445,883	\$ 1,548,913	\$ 1,548,913	\$	1,324,018
5	2025	0.821927	\$ 156,422,248	\$ 128,567,686	\$ 121,706,165	\$ 100,033,596	\$ 7,530,295	\$ 6,189,353	\$ 15,920,878	\$ 13,085,801	\$ 1,569,665	\$ 1,569,665	\$	1,290,150
6	2026	0.790315	\$ 160,646,401	\$ 126,961,184	\$ 124,254,725	\$ 98,200,314	\$ 7,687,981	\$ 6,075,923	\$ 16,111,975	\$ 12,733,528	\$ 1,590,416	\$ 1,590,416	\$	1,256,929
7	2027	0.759918	\$ 164,870,554	\$ 125,288,071	\$ 126,803,286	\$ 96,360,076	\$ 7,845,668	\$ 5,962,062	\$ 16,303,071	\$ 12,388,994	\$ 1,611,167	\$ 1,611,167	\$	1,224,354
8	2028	0.73069	\$ 169,094,707	\$ 123,555,846	\$ 129,351,846	\$ 94,516,127	\$ 8,003,354	\$ 5,847,972	\$ 16,494,168	\$ 12,052,127	\$ 1,631,918	\$ 1,631,918	\$	1,192,427
9	2029	0.702587	\$ 179,202,052	\$ 125,904,985	\$ 131,862,510	\$ 102,644,851	\$ 8,158,696	\$ 5,732,191	\$ 16,701,317	\$ 11,734,123	\$ 1,666,916	\$ 1,666,916	\$	1,171,153
10	2030	0.675564	\$ 189,309,396	\$ 127,890,645	\$ 134,373,174	\$ 90,777,702	\$ 8,314,037	\$ 5,616,666	\$ 16,908,465	\$ 11,422,753	\$ 1,701,914	\$ 1,701,914	\$	1,149,752
11	2031	0.649581	\$ 199,416,741	\$ 129,537,312	\$ 136,883,838	\$ 88,917,131	\$ 8,469,379	\$ 5,501,547	\$ 17,115,613	\$ 11,117,976	\$ 1,736,912	\$ 1,736,912	\$	1,128,265
12	2032	0.624597	\$ 209,524,085	\$ 130,868,126	\$ 139,394,502	\$ 87,065,395	\$ 8,624,721	\$ 5,386,975	\$ 17,322,762	\$ 10,819,746	\$ 1,771,910	\$ 1,771,910	\$	1,106,730
13	2033	0.600574	\$ 219,631,430	\$ 131,904,945	\$ 141,905,166	\$ 85,224,565	\$ 8,780,062	\$ 5,273,078	\$ 17,529,910	\$ 10,528,010	\$ 1,806,908	\$ 1,806,908	\$	1,085,182
14	2034	0.577475	\$ 229,738,774	\$ 132,668,418	\$ 144,415,830	\$ 83,396,543	\$ 8,935,404	\$ 5,159,973	\$ 17,737,059	\$ 10,242,709	\$ 1,841,907	\$ 1,841,907	\$	1,063,655
15	2035	0.555265	\$ 239,846,119	\$ 133,178,036	\$ 146,926,494	\$ 81,583,067	\$ 9,090,746	\$ 5,047,768	\$ 17,944,207	\$ 9,963,781	\$ 1,876,905	\$ 1,876,905	\$	1,042,179
16	2036	0.533908	\$ 249,953,463	\$ 133,452,198	\$ 149,437,158	\$ 79,785,720	\$ 9,246,087	\$ 4,936,562	\$ 18,151,356	\$ 9,691,157	\$ 1,911,903	\$ 1,911,903	\$	1,020,780
17	2037	0.513373	\$ 260,060,808	\$ 133,508,261	\$ 151,947,822	\$ 78,005,947	\$ 9,401,429	\$ 4,826,442	\$ 18,358,504	\$ 9,424,765	\$ 1,946,901	\$ 1,946,901	\$	999,487
18	2038	0.493628	\$ 270,168,152	\$ 133,362,597	\$ 154,458,486	\$ 76,245,052	\$ 9,556,771	\$ 4,717,491	\$ 18,565,652	\$ 9,164,528	\$ 1,981,899	\$ 1,981,899	\$	978,321
19	2039	0.474642	\$ 280,275,497	\$ 133,030,641	\$ 156,969,150	\$ 74,504,218	\$ 9,712,112	\$ 4,609,781	\$ 18,772,801	\$ 8,910,368	\$ 2,016,897	\$ 2,016,897	\$	957,305
20	2040	0.456387	\$ 290,382,842	\$ 132,526,938	\$ 159,479,814	\$ 72,784,505	\$ 9,867,454	\$ 4,503,377	\$ 18,979,949	\$ 8,662,201	\$ 2,051,895	\$ 2,051,895	\$	936,458
21	2041	0.438834	\$ 300,490,186	\$ 131,865,191	\$ 161,990,478	\$ 71,086,865	\$ 10,022,796	\$ 4,398,340	\$ 19,187,098	\$ 8,419,943	\$ 2,086,893	\$ 2,086,893	\$	915,799
22	2042	0.421955	\$ 310,597,531	\$ 131,058,301	\$ 164,501,142	\$ 69,412,143	\$ 10,178,137	\$ 4,294,720	\$ 19,394,246	\$ 8,183,507	\$ 2,121,891	\$ 2,121,891	\$	895,343
23	2043	0.405726	\$ 320,704,875	\$ 130,118,413	\$ 167,011,806	\$ 67,761,088	\$ 10,333,479	\$ 4,192,565	\$ 19,601,395	\$ 7,952,802	\$ 2,156,889	\$ 2,156,889	\$	875,107
24	2044	0.390121	\$ 330,812,220	\$ 129,056,951	\$ 169,522,470	\$ 66,134,356	\$ 10,488,821	\$ 4,091,914	\$ 19,808,543	\$ 7,727,738	\$ 2,191,887	\$ 2,191,887	\$	855,102
25	2045	0.375117	\$ 340,919,564	\$ 127,884,657	\$ 172,033,134	\$ 64,532,519	\$ 10,644,162	\$ 3,992,804	\$ 20,015,691	\$ 7,508,222	\$ 2,226,885	\$ 2,226,885	\$	835,342
26	2046	0.360689	\$ 351,026,909	\$ 126,611,626	\$ 174,543,798	\$ 62,956,068	\$ 10,799,504	\$ 3,895,265	\$ 20,222,840	\$ 7,294,161	\$ 2,261,883	\$ 2,261,883	\$	815,837
27	2047	0.346817	\$ 361,134,253	\$ 125,247,343	\$ 177,054,462	\$ 61,405,421	\$ 10,954,846	\$ 3,799,322	\$ 20,429,988	\$ 7,085,458	\$ 2,296,881	\$ 2,296,881	\$	796,597
28	2048	0.333477	\$ 371,241,598	\$ 123,800,709	\$ 179,565,126	\$ 59,880,924	\$ 11,110,187	\$ 3,704,997	\$ 20,637,137	\$ 6,882,020	\$ 2,331,880	\$ 2,331,880	\$	777,629
29	2049	0.320651	\$ 371,241,598	\$ 119,039,144	\$ 179,565,126	\$ 57,577,812	\$ 11,110,187	\$ 3,562,497	\$ 20,637,137	\$ 6,617,327	\$ 2,331,880	\$ 2,331,880	\$	747,720
30	2050	0.308319	\$ 371,241,598	\$ 114,460,715	\$ 179,565,126	\$ 55,363,280	\$ 11,110,187	\$ 3,425,478	\$ 20,637,137	\$ 6,362,814	\$ 2,331,880	\$ 2,331,880	\$	718,962
31	2051	0.29646	\$ 371,241,598	\$ 110,058,380	\$ 179,565,126	\$ 53,233,923	\$ 11,110,187	\$ 3,293,729	\$ 20,637,137	\$ 6,118,091	\$ 2,331,880	\$ 2,331,880	\$	691,310
32	2052	0.285058	\$ 371,241,598	\$ 105,825,365	\$ 179,565,126	\$ 51,186,465	\$ 11,110,187	\$ 3,167,047	\$ 20,637,137	\$ 5,882,780	\$ 2,331,880	\$ 2,331,880	\$	664,721
33	2053	0.274094	\$ 371,241,598	\$ 101,755,159	\$ 179,565,126	\$ 49,217,755	\$ 11,110,187	\$ 3,045,238	\$ 20,637,137	\$ 5,656,519	\$ 2,331,880	\$ 2,331,880	\$	639,155
34	2054	0.263552	\$ 371,241,598	\$ 97,841,499	\$ 179,565,126	\$ 47,324,764	\$ 11,110,187	\$ 2,928,113	\$ 20,637,137	\$ 5,438,960	\$ 2,331,880	\$ 2,331,880	\$	614,572
35	2055	0.253415	\$ 371,241,598	\$ 94,078,364	\$ 179,565,126	\$ 45,504,581	\$ 11,110,187	\$ 2,815,493	\$ 20,637,137	\$ 5,229,770	\$ 2,331,880	\$ 2,331,880	\$	590,934
36	2056	0.243669	\$ 371,241,598	\$ 90,459,966	\$ 179,565,126	\$ 43,754,405	\$ 11,110,187	\$ 2,707,205	\$ 20,637,137	\$ 5,028,625	\$ 2,331,880	\$ 2,331,880	\$	568,206
37	2057	0.234297	\$ 371,241,598	\$ 86,980,736	\$ 179,565,126	\$ 42,071,543	\$ 11,110,187	\$ 2,603,082	\$ 20,637,137	\$ 4,835,216	\$ 2,331,880	\$ 2,331,880	\$	546,352
38	2058	0.225285	\$ 371,241,598	\$ 83,635,323	\$ 179,565,126	\$ 40,453,407	\$ 11,110,187	\$ 2,502,963	\$ 20,637,137	\$ 4,649,246	\$ 2,331,880	\$ 2,331,880	\$	525,338
39	2059	0.216621	\$ 371,241,598	\$ 80,418,580	\$ 179,565,126	\$ 38,897,506	\$ 11,110,187	\$ 2,406,696	\$ 20,637,137	\$ 4,470,429	\$ 2,331,880	\$ 2,331,880	\$	505,133
40	2060	0.208289	\$ 371,241,598	\$ 77,325,558	\$ 179,565,126	\$ 37,401,448	\$ 11,110,187	\$ 2,314,130	\$ 20,637,137	\$ 4,298,489	\$ 2,331,880	\$ 2,331,880	\$	485,705
41	2061	0.200278	\$ 371,241,598	\$ 74,351,498	\$ 179,565,126	\$ 35,962,931	\$ 11,110,187	\$ 2,225,125	\$ 20,637,137	\$ 4,133,163	\$ 2,331,880	\$ 2,331,880	\$	467,024
42	2062	0.192575	\$ 371,241,598	\$ 71,491,825	\$ 179,565,126	\$ 34,579,742	\$ 11,110,187	\$ 2,139,544	\$ 20,637,137	\$ 3,974,195	\$ 2,331,880	\$ 2,331,880	\$	449,062
43	2063	0.185168	\$ 371,241,598	\$ 68,742,139	\$ 179,565,126	\$ 33,249,751	\$ 11,110,187	\$ 2,057,253	\$ 20,637,137	\$ 3,821,341	\$ 2,331,880	\$ 2,331,880	\$	431,790
44	2064	0.178046	\$ 371,241,598	\$ 66,098,211	\$ 179,565,126	\$ 31,970,915	\$ 11,110,187	\$ 1,978,128	\$ 20,637,137	\$ 3,674,367	\$ 2,331,880	\$ 2,331,880	\$	415,183
45	2065	0.171198	\$ 371,241,598	\$ 63,555,972	\$ 179,565,126	\$ 30,741,264	\$ 11,110,187	\$ 1,902,046	\$ 20,637,137	\$ 3,533,045	\$ 2,331,880	\$ 2,331,880	\$	399,214
46	2066	0.164614	\$ 371,241,598	\$ 61,111,511	\$ 179,565,126	\$ 29,558,908	\$ 11,110,187	\$ 1,828,891	\$ 20,637,137	\$ 3,397,159	\$ 2,331,880	\$ 2,331,880	\$	383,860
47	2067	0.158283	\$ 371,241,598	\$ 58,761,069	\$ 179,565,126	\$ 28,422,027	\$ 11,110,187	\$ 1,758,549	\$ 20,637,137	\$ 3,266,499	\$ 2,331,880	\$ 2,331,880	\$	369,096
48	2068	0.152195	\$ 371,241,598	\$ 56,501,028	\$ 179,565,126	\$ 27,328,872	\$ 11,110,187	\$ 1,690,912	\$ 20,637,137	\$ 3,140,864	\$ 2,331,880	\$ 2,331,880	\$	354,900
49	2069	0.146341	\$ 371,241,598	\$ 54,327,911	\$ 179,565,126	\$ 26,277,762	\$ 11,110,187	\$ 1,625,877	\$ 20,637,137	\$ 3,020,062	\$ 2,331,880	\$ 2,331,880	\$	341,250
50	2070	0.140713	\$ 371,241,598	\$ 52,238,376	\$ 179,565,126	\$ 25,267,078	\$ 11,110,187	\$ 1,563,344	\$ 20,637,137	\$ 2,903,905	\$ 2,331,880	\$ 2,331,880	\$	328,125
51	2071	0.135301	\$ 371,241,											

Preferred Option Including Priority Lanes - Walking and Cycling, PT Service Improvements																								
TT	Discounted		Step Change		VOC		Discounted		Step Change		CO2		Discounted		Step Change		Crash Cost		Discounted		Step Change			
\$	126,853,177				\$		103,866,241				\$		6,426,490				\$		14,583,200					
\$	130,768,774				\$		106,293,660				\$		6,576,681				\$		14,759,638					
\$	134,684,371	\$ 134,684,371	\$	135,301,483	\$	108,721,078	\$	108,721,078	\$	108,963,362	\$	6,726,872	\$	6,726,872	\$	6,741,862	\$	14,936,077	\$	14,936,077	\$	14,965,394	\$	14,965,394
\$	138,599,968	\$ 133,269,200	\$	134,159,265	\$	111,148,496	\$	106,873,554	\$	107,223,003	\$	6,877,063	\$	6,612,560	\$	6,899,549	\$	15,112,515	\$	14,531,265	\$	14,573,549	\$	14,573,549
\$	142,515,565	\$ 131,763,651	\$	132,904,761	\$	113,575,914	\$	105,007,317	\$	105,455,329	\$	7,027,254	\$	6,497,091	\$	7,057,235	\$	15,288,954	\$	14,135,497	\$	14,189,707	\$	14,189,707
\$	146,431,162	\$ 130,176,770	\$	131,548,296	\$	116,003,333	\$	103,126,540	\$	103,665,015	\$	7,177,445	\$	6,380,722	\$	7,214,922	\$	15,465,392	\$	13,748,677	\$	13,813,834	\$	13,813,834
\$	150,346,760	\$ 128,517,040	\$	130,099,570	\$	118,430,751	\$	101,235,102	\$	101,856,420	\$	7,327,636	\$	6,263,694	\$	7,372,608	\$	15,641,830	\$	13,370,702	\$	13,445,883	\$	13,445,883
\$	154,262,357	\$ 126,792,413	\$	128,567,686	\$	120,858,169	\$	99,336,605	\$	100,033,596	\$	7,477,827	\$	6,146,229	\$	7,530,295	\$	15,818,269	\$	13,001,464	\$	13,085,801	\$	13,085,801
\$	158,177,954	\$ 125,010,335	\$	124,840,889	\$	123,285,587	\$	97,434,390	\$	97,367,864	\$	7,628,018	\$	6,028,533	\$	6,024,417	\$	15,994,707	\$	12,640,849	\$	12,632,800	\$	12,632,800
\$	162,093,551	\$ 123,177,777	\$	122,994,483	\$	125,713,005	\$	95,531,552	\$	95,459,589	\$	7,778,209	\$	5,910,799	\$	5,906,347	\$	16,171,145	\$	12,288,741	\$	12,280,034	\$	12,280,034
\$	166,009,148	\$ 121,301,258	\$	121,105,431	\$	128,140,424	\$	93,630,952	\$	93,554,069	\$	7,928,400	\$	5,793,204	\$	5,788,447	\$	16,347,584	\$	11,945,019	\$	11,935,716	\$	11,935,716
\$	175,074,520	\$ 123,005,035	\$	122,753,154	\$	130,491,783	\$	91,681,796	\$	91,598,148	\$	8,073,885	\$	5,672,604	\$	5,667,429	\$	16,545,518	\$	11,624,661	\$	11,615,154	\$	11,615,154
\$	184,139,891	\$ 124,398,312	\$	124,094,979	\$	132,843,143	\$	89,744,068	\$	89,654,289	\$	8,219,370	\$	5,552,712	\$	5,547,157	\$	16,743,452	\$	11,311,276	\$	11,301,594	\$	11,301,594
\$	193,205,263	\$ 125,502,454	\$	125,502,454	\$	135,194,503	\$	87,819,771	\$	87,819,771	\$	8,364,855	\$	5,433,650	\$	5,433,650	\$	16,941,386	\$	11,004,801	\$	11,004,801	\$	11,004,801
\$	202,270,634	\$ 126,337,641	\$	126,337,641	\$	137,545,863	\$	85,910,740	\$	85,910,740	\$	8,510,340	\$	5,315,533	\$	5,315,533	\$	17,139,320	\$	10,705,169	\$	10,705,169	\$	10,705,169
\$	211,336,006	\$ 126,922,928	\$	126,922,928	\$	139,897,222	\$	84,018,646	\$	84,018,646	\$	8,655,825	\$	5,198,464	\$	5,198,464	\$	17,337,254	\$	10,412,306	\$	10,412,306	\$	10,412,306
\$	220,401,377	\$ 127,276,303	\$	127,276,303	\$	142,248,582	\$	82,145,012	\$	82,145,012	\$	8,801,310	\$	5,082,537	\$	5,082,537	\$	17,535,188	\$	10,126,134	\$	10,126,134	\$	10,126,134
\$	229,466,749	\$ 127,414,740	\$	127,414,740	\$	144,599,942	\$	80,291,215	\$	80,291,215	\$	8,946,795	\$	4,967,838	\$	4,967,838	\$	17,733,122	\$	9,846,573	\$	9,846,573	\$	9,846,573
\$	238,532,120	\$ 127,354,249	\$	127,354,249	\$	146,951,302	\$	78,458,501	\$	78,458,501	\$	9,092,281	\$	4,854,443	\$	4,854,443	\$	17,931,056	\$	9,573,538	\$	9,573,538	\$	9,573,538
\$	247,597,492	\$ 127,109,928	\$	127,109,928	\$	149,302,661	\$	76,647,992	\$	76,647,992	\$	9,237,766	\$	4,742,422	\$	4,742,422	\$	18,128,990	\$	9,306,939	\$	9,306,939	\$	9,306,939
\$	256,662,863	\$ 126,696,007	\$	126,696,007	\$	151,654,021	\$	74,860,689	\$	74,860,689	\$	9,383,251	\$	4,631,836	\$	4,631,836	\$	18,326,924	\$	9,046,685	\$	9,046,685	\$	9,046,685
\$	265,728,235	\$ 126,125,893	\$	126,125,893	\$	154,005,381	\$	73,097,487	\$	73,097,487	\$	9,528,736	\$	4,522,742	\$	4,522,742	\$	18,524,858	\$	8,792,684	\$	8,792,684	\$	8,792,684
\$	274,793,606	\$ 125,412,215	\$	125,412,215	\$	156,356,741	\$	71,359,175	\$	71,359,175	\$	9,674,221	\$	4,415,188	\$	4,415,188	\$	18,722,793	\$	8,544,838	\$	8,544,838	\$	8,544,838
\$	283,858,978	\$ 124,566,858	\$	124,566,858	\$	158,708,100	\$	69,646,447	\$	69,646,447	\$	9,819,706	\$	4,309,217	\$	4,309,217	\$	18,920,727	\$	8,303,051	\$	8,303,051	\$	8,303,051
\$	292,924,349	\$ 123,601,007	\$	123,601,007	\$	161,059,460	\$	67,959,907	\$	67,959,907	\$	9,965,191	\$	4,204,866	\$	4,204,866	\$	19,118,661	\$	8,067,222	\$	8,067,222	\$	8,067,222
\$	301,989,720	\$ 122,525,182	\$	122,525,182	\$	163,410,820	\$	66,300,073	\$	66,300,073	\$	10,110,676	\$	4,102,168	\$	4,102,168	\$	19,316,595	\$	7,837,251	\$	7,837,251	\$	7,837,251
\$	311,055,092	\$ 121,349,271	\$	121,349,271	\$	165,762,179	\$	64,667,386	\$	64,667,386	\$	10,256,161	\$	4,001,149	\$	4,001,149	\$	19,514,529	\$	7,613,037	\$	7,613,037	\$	7,613,037
\$	320,120,463	\$ 120,082,565	\$	120,082,565	\$	168,113,539	\$	63,062,213	\$	63,062,213	\$	10,401,646	\$	3,901,832	\$	3,901,832	\$	19,712,463	\$	7,394,476	\$	7,394,476	\$	7,394,476
\$	329,185,835	\$ 118,733,786	\$	118,733,786	\$	170,464,899	\$	61,484,854	\$	61,484,854	\$	10,547,131	\$	3,804,237	\$	3,804,237	\$	19,910,397	\$	7,181,466	\$	7,181,466	\$	7,181,466
\$	338,251,206	\$ 117,311,123	\$	117,311,123	\$	172,816,259	\$	59,935,542	\$	59,935,542	\$	10,692,616	\$	3,708,377	\$	3,708,377	\$	20,108,331	\$	6,973,902	\$	6,973,902	\$	6,973,902
\$	347,316,578	\$ 115,822,254	\$	115,822,254	\$	175,167,618	\$	58,414,454	\$	58,414,454	\$	10,838,102	\$	3,614,263	\$	3,614,263	\$	20,306,265	\$	6,771,682	\$	6,771,682	\$	6,771,682
\$	347,316,578	\$ 111,367,552	\$	111,367,552	\$	175,167,618	\$	56,167,745	\$	56,167,745	\$	10,838,102	\$	3,475,253	\$	3,475,253	\$	20,306,265	\$	6,511,233	\$	6,511,233	\$	6,511,233
\$	347,316,578	\$ 107,084,185	\$	107,084,185	\$	175,167,618	\$	54,007,447	\$	54,007,447	\$	10,838,102	\$	3,341,589	\$	3,341,589	\$	20,306,265	\$	6,260,801	\$	6,260,801	\$	6,260,801
\$	347,316,578	\$ 102,965,562	\$	102,965,562	\$	175,167,618	\$	51,930,237	\$	51,930,237	\$	10,838,102	\$	3,213,066	\$	3,213,066	\$	20,306,265	\$	6,020,001	\$	6,020,001	\$	6,020,001
\$	347,316,578	\$ 99,005,348	\$	99,005,348	\$	175,167,618	\$	49,932,920	\$	49,932,920	\$	10,838,102	\$	3,089,487	\$	3,089,487	\$	20,306,265	\$	5,788,462	\$	5,788,462	\$	5,788,462
\$	347,316,578	\$ 95,197,450	\$	95,197,450	\$	175,167,618	\$	48,012,424	\$	48,012,424	\$	10,838,102	\$	2,970,660	\$	2,970,660	\$	20,306,265	\$	5,565,829	\$	5,565,829	\$	5,565,829
\$	347,316,578	\$ 91,536,010	\$	91,536,010	\$	175,167,618	\$	46,165,792	\$	46,165,792	\$	10,838,102	\$	2,856,404	\$	2,856,404	\$	20,306,265	\$	5,351,759	\$	5,351,759	\$	5,351,759
\$	347,316,578	\$ 88,015,394	\$	88,015,394	\$	175,167,618	\$	44,390,184	\$	44,390,184	\$	10,838,102	\$	2,746,543	\$	2,746,543	\$	20,306,265	\$	5,145,922	\$	5,145,922	\$	5,145,922
\$	347,316,578	\$ 84,630,187	\$	84,630,187	\$	175,167,618	\$	42,682,870	\$	42,682,870	\$	10,838,102	\$	2,640,906	\$	2,640,906	\$	20,306,265	\$	4,948,002	\$	4,948,002	\$	4,948,002
\$	347,316,578	\$ 81,375,179	\$	81,375,179	\$	175,167,618	\$	41,041,221	\$	41,041,221	\$	10,838,102	\$	2,539,333	\$	2,539,333	\$	20,306,265	\$	4,757,694	\$	4,757,694	\$	4,757,694
\$	347,316,578	\$ 78,245,365	\$	78,245,365	\$	175,167,618	\$	39,462,712	\$	39,462,712	\$	10,838,102	\$	2,441,666	\$	2,441,666	\$	20,306,265	\$	4,574,706	\$	4,574,706	\$	4,574,706
\$	347,316,578	\$ 75,235,928	\$	75,235,928	\$	175,167,618	\$	37,944,916	\$	37,944,916	\$	10,838,102	\$	2,347,756	\$	2,347,756	\$	20,306,265	\$	4,398,755	\$	4,398,755	\$	4,398,755
\$	347,316,578	\$ 72,342,238	\$	72,342,238	\$	175,167,618	\$	36,485,496	\$	36,485,496	\$	10,838,102	\$	2,257,458	\$	2,257,458	\$	20,306,265	\$	4,229,573	\$	4,229,573	\$	4,229,573
\$	347,316,578	\$ 69,559,844	\$	69,559,844	\$	17																		

Step Change	VOC	Discounted	Step Change	CO2	Discounted	Step Change	Crash Cost	Discounted	Step Change	Bus TT	Discounted
	\$ 103,866,241			\$ 6,426,490			\$ 14,583,200			\$ 1,424,406	
	\$ 106,213,304			\$ 6,571,709			\$ 14,716,642			\$ 1,700,651	
\$ 135,301,483	\$ 108,560,366	\$ 108,560,366	\$ 108,963,362	\$ 6,716,928	\$ 6,716,928	\$ 6,741,862	\$ 14,850,083	\$ 14,850,083	\$ 14,965,394	\$ 1,976,896	\$ 1,976,896
\$ 134,159,265	\$ 110,907,428	\$ 106,641,758	\$ 107,223,003	\$ 6,862,147	\$ 6,598,218	\$ 6,634,182	\$ 14,983,525	\$ 14,407,236	\$ 14,573,549	\$ 2,253,140	\$ 2,166,481
\$ 132,904,761	\$ 113,254,490	\$ 104,710,143	\$ 105,455,329	\$ 7,007,366	\$ 6,478,704	\$ 6,524,811	\$ 15,116,967	\$ 13,976,486	\$ 14,189,707	\$ 2,529,385	\$ 2,338,558
\$ 131,548,296	\$ 115,601,553	\$ 102,769,359	\$ 103,665,015	\$ 7,152,586	\$ 6,358,622	\$ 6,414,039	\$ 15,250,409	\$ 13,557,558	\$ 13,813,834	\$ 2,805,629	\$ 2,494,194
\$ 130,099,570	\$ 117,948,615	\$ 100,822,970	\$ 101,856,420	\$ 7,297,805	\$ 6,238,194	\$ 6,302,136	\$ 15,383,850	\$ 13,150,180	\$ 13,445,883	\$ 3,081,874	\$ 2,634,399
\$ 128,567,686	\$ 120,295,677	\$ 98,874,278	\$ 100,033,596	\$ 7,443,024	\$ 6,117,623	\$ 6,189,353	\$ 15,517,292	\$ 12,754,083	\$ 13,085,801	\$ 3,358,118	\$ 2,760,128
\$ 124,840,889	\$ 122,642,739	\$ 96,926,338	\$ 97,367,864	\$ 7,588,243	\$ 5,997,099	\$ 6,024,417	\$ 15,650,734	\$ 12,369,002	\$ 12,632,800	\$ 3,634,363	\$ 2,872,290
\$ 122,994,483	\$ 124,989,802	\$ 94,981,977	\$ 95,459,589	\$ 7,733,462	\$ 5,876,796	\$ 5,906,347	\$ 15,784,175	\$ 11,994,676	\$ 12,280,034	\$ 3,910,607	\$ 2,971,740
\$ 121,105,431	\$ 127,336,864	\$ 93,043,799	\$ 93,554,069	\$ 7,878,681	\$ 5,756,875	\$ 5,788,447	\$ 15,917,617	\$ 11,630,847	\$ 11,935,716	\$ 4,186,852	\$ 3,059,292
\$ 122,753,154	\$ 129,675,658	\$ 91,108,397	\$ 91,598,148	\$ 8,023,389	\$ 5,637,127	\$ 5,667,429	\$ 16,097,153	\$ 11,309,646	\$ 11,615,154	\$ 4,280,568	\$ 3,007,470
\$ 124,094,979	\$ 132,014,453	\$ 89,184,234	\$ 89,654,289	\$ 8,168,097	\$ 5,518,073	\$ 5,547,157	\$ 16,276,689	\$ 10,995,948	\$ 11,301,594	\$ 4,374,283	\$ 2,955,109
\$ 125,502,454	\$ 134,353,247	\$ 87,273,307	\$ 87,819,771	\$ 8,312,804	\$ 5,399,839	\$ 5,433,650	\$ 16,456,225	\$ 10,689,650	\$ 11,004,801	\$ 4,467,999	\$ 2,902,327
\$ 126,337,641	\$ 136,692,041	\$ 85,377,446	\$ 85,910,740	\$ 8,457,512	\$ 5,282,537	\$ 5,315,533	\$ 16,635,760	\$ 10,390,647	\$ 10,705,169	\$ 4,561,715	\$ 2,849,233
\$ 126,922,928	\$ 139,030,836	\$ 83,498,317	\$ 84,018,646	\$ 8,602,220	\$ 5,166,270	\$ 5,198,464	\$ 16,815,296	\$ 10,098,831	\$ 10,412,306	\$ 4,655,430	\$ 2,795,931
\$ 131,114,739	\$ 141,369,630	\$ 81,637,439	\$ 81,637,439	\$ 8,746,927	\$ 5,051,133	\$ 5,051,133	\$ 16,994,832	\$ 9,814,092	\$ 9,814,092	\$ 4,749,146	\$ 2,742,513
\$ 130,698,461	\$ 143,708,424	\$ 79,796,187	\$ 79,796,187	\$ 8,891,635	\$ 4,937,209	\$ 4,937,209	\$ 17,174,368	\$ 9,536,317	\$ 9,536,317	\$ 4,842,862	\$ 2,689,069
\$ 130,120,249	\$ 146,047,219	\$ 77,975,804	\$ 77,975,804	\$ 9,036,342	\$ 4,824,577	\$ 4,824,577	\$ 17,353,904	\$ 9,265,391	\$ 9,265,391	\$ 4,936,577	\$ 2,635,679
\$ 129,393,173	\$ 148,386,013	\$ 76,177,409	\$ 76,177,409	\$ 9,181,050	\$ 4,713,305	\$ 4,713,305	\$ 17,533,440	\$ 9,001,199	\$ 9,001,199	\$ 5,030,293	\$ 2,582,418
\$ 128,529,540	\$ 150,724,808	\$ 74,402,004	\$ 74,402,004	\$ 9,325,758	\$ 4,603,456	\$ 4,603,456	\$ 17,712,975	\$ 8,743,623	\$ 8,743,623	\$ 5,124,009	\$ 2,529,355
\$ 127,540,931	\$ 153,063,602	\$ 72,650,479	\$ 72,650,479	\$ 9,470,465	\$ 4,495,085	\$ 4,495,085	\$ 17,892,511	\$ 8,492,545	\$ 8,492,545	\$ 5,217,724	\$ 2,476,553
\$ 126,438,236	\$ 155,402,396	\$ 70,923,625	\$ 70,923,625	\$ 9,615,173	\$ 4,388,239	\$ 4,388,239	\$ 18,072,047	\$ 8,247,846	\$ 8,247,846	\$ 5,311,440	\$ 2,424,072
\$ 125,231,694	\$ 157,741,191	\$ 69,222,135	\$ 69,222,135	\$ 9,759,881	\$ 4,282,964	\$ 4,282,964	\$ 18,251,583	\$ 8,009,408	\$ 8,009,408	\$ 5,405,156	\$ 2,371,964
\$ 123,930,924	\$ 160,079,985	\$ 67,546,612	\$ 67,546,612	\$ 9,904,588	\$ 4,179,294	\$ 4,179,294	\$ 18,431,119	\$ 7,777,110	\$ 7,777,110	\$ 5,498,871	\$ 2,320,278
\$ 122,544,959	\$ 162,418,780	\$ 65,897,576	\$ 65,897,576	\$ 10,049,296	\$ 4,077,264	\$ 4,077,264	\$ 18,610,654	\$ 7,550,833	\$ 7,550,833	\$ 5,592,587	\$ 2,269,060
\$ 121,082,277	\$ 164,757,574	\$ 64,275,468	\$ 64,275,468	\$ 10,194,004	\$ 3,976,900	\$ 3,976,900	\$ 18,790,190	\$ 7,330,457	\$ 7,330,457	\$ 5,686,303	\$ 2,218,349
\$ 119,550,830	\$ 167,096,368	\$ 62,680,655	\$ 62,680,655	\$ 10,338,711	\$ 3,878,224	\$ 3,878,224	\$ 18,969,726	\$ 7,115,863	\$ 7,115,863	\$ 5,780,018	\$ 2,168,182
\$ 117,958,070	\$ 169,435,163	\$ 61,113,439	\$ 61,113,439	\$ 10,483,419	\$ 3,781,256	\$ 3,781,256	\$ 19,149,262	\$ 6,906,933	\$ 6,906,933	\$ 5,873,734	\$ 2,118,593
\$ 116,310,980	\$ 171,773,957	\$ 59,574,055	\$ 59,574,055	\$ 10,628,126	\$ 3,686,010	\$ 3,686,010	\$ 19,328,798	\$ 6,703,547	\$ 6,703,547	\$ 5,967,450	\$ 2,069,610
\$ 114,616,095	\$ 174,112,752	\$ 58,062,680	\$ 58,062,680	\$ 10,772,834	\$ 3,592,497	\$ 3,592,497	\$ 19,508,334	\$ 6,505,590	\$ 6,505,590	\$ 6,061,165	\$ 2,021,262
\$ 110,207,784	\$ 174,112,752	\$ 55,829,500	\$ 55,829,500	\$ 10,772,834	\$ 3,454,324	\$ 3,454,324	\$ 19,508,334	\$ 6,255,375	\$ 6,255,375	\$ 6,061,165	\$ 1,943,521
\$ 105,969,023	\$ 174,112,752	\$ 53,682,212	\$ 53,682,212	\$ 10,772,834	\$ 3,321,466	\$ 3,321,466	\$ 19,508,334	\$ 6,014,783	\$ 6,014,783	\$ 6,061,165	\$ 1,868,770
\$ 101,893,291	\$ 174,112,752	\$ 51,617,511	\$ 51,617,511	\$ 10,772,834	\$ 3,193,717	\$ 3,193,717	\$ 19,508,334	\$ 5,783,446	\$ 5,783,446	\$ 6,061,165	\$ 1,796,895
\$ 97,974,319	\$ 174,112,752	\$ 49,632,222	\$ 49,632,222	\$ 10,772,834	\$ 3,070,882	\$ 3,070,882	\$ 19,508,334	\$ 5,561,005	\$ 5,561,005	\$ 6,061,165	\$ 1,727,783
\$ 94,206,075	\$ 174,112,752	\$ 47,723,291	\$ 47,723,291	\$ 10,772,834	\$ 2,952,771	\$ 2,952,771	\$ 19,508,334	\$ 5,347,121	\$ 5,347,121	\$ 6,061,165	\$ 1,661,330
\$ 90,582,765	\$ 174,112,752	\$ 45,887,779	\$ 45,887,779	\$ 10,772,834	\$ 2,839,203	\$ 2,839,203	\$ 19,508,334	\$ 5,141,462	\$ 5,141,462	\$ 6,061,165	\$ 1,597,433
\$ 87,098,812	\$ 174,112,752	\$ 44,122,865	\$ 44,122,865	\$ 10,772,834	\$ 2,730,003	\$ 2,730,003	\$ 19,508,334	\$ 4,943,714	\$ 4,943,714	\$ 6,061,165	\$ 1,535,993
\$ 83,748,858	\$ 174,112,752	\$ 42,425,832	\$ 42,425,832	\$ 10,772,834	\$ 2,625,003	\$ 2,625,003	\$ 19,508,334	\$ 4,753,571	\$ 4,753,571	\$ 6,061,165	\$ 1,476,916
\$ 80,527,748	\$ 174,112,752	\$ 40,794,069	\$ 40,794,069	\$ 10,772,834	\$ 2,524,041	\$ 2,524,041	\$ 19,508,334	\$ 4,570,741	\$ 4,570,741	\$ 6,061,165	\$ 1,420,112
\$ 77,430,527	\$ 174,112,752	\$ 39,225,066	\$ 39,225,066	\$ 10,772,834	\$ 2,426,963	\$ 2,426,963	\$ 19,508,334	\$ 4,394,943	\$ 4,394,943	\$ 6,061,165	\$ 1,365,492
\$ 74,452,430	\$ 174,112,752	\$ 37,716,410	\$ 37,716,410	\$ 10,772,834	\$ 2,333,618	\$ 2,333,618	\$ 19,508,334	\$ 4,225,907	\$ 4,225,907	\$ 6,061,165	\$ 1,312,973
\$ 71,588,875	\$ 174,112,752	\$ 36,265,779	\$ 36,265,779	\$ 10,772,834	\$ 2,243,863	\$ 2,243,863	\$ 19,508,334	\$ 4,063,372	\$ 4,063,372	\$ 6,061,165	\$ 1,262,474
\$ 68,835,457	\$ 174,112,752	\$ 34,870,941	\$ 34,870,941	\$ 10,772,834	\$ 2,157,561	\$ 2,157,561	\$ 19,508,334	\$ 3,907,089	\$ 3,907,089	\$ 6,061,165	\$ 1,213,918
\$ 66,187,939	\$ 174,112,752	\$ 33,529,751	\$ 33,529,751	\$ 10,772,834	\$ 2,074,578	\$ 2,074,578	\$ 19,508,334	\$ 3,756,816	\$ 3,756,816	\$ 6,061,165	\$ 1,167,228
\$ 63,642,249	\$ 174,112,752	\$ 32,240,145	\$ 32,240,145	\$ 10,772,834	\$ 1,994,786	\$ 1,994,786	\$ 19,508,334	\$ 3,612,323	\$ 3,612,323	\$ 6,061,165	\$ 1,122,335
\$ 61,194,470	\$ 174,112,752	\$ 31,000,140	\$ 31,000,140	\$ 10,772,834	\$ 1,918,064	\$ 1,918,064	\$ 19,508,334	\$ 3,473,388	\$ 3,473,388	\$ 6,061,165	\$ 1,079,168
\$ 58,840,837	\$ 174,112,752	\$ 29,807,827	\$ 29,807,827	\$ 10,772,834	\$ 1,844,292	\$ 1,844,292	\$ 19,508,334	\$ 3,339,796	\$ 3,339,796	\$ 6,061,165	\$ 1,037,662
\$ 56,577,728	\$ 174,112,752	\$ 28,661,372	\$ 28,661,372	\$ 10,772,834	\$ 1,773,358	\$ 1,773,358	\$ 19,508,334	\$ 3,211,342	\$ 3,211,342	\$ 6,061,165	\$ 997,752
\$ 54,401,661	\$ 174,112,752	\$ 27,559,011	\$ 27,559,011	\$ 10,772,834	\$ 1,705,152	\$ 1,705,152	\$ 19,508,334	\$ 3,087,829	\$ 3,087,829	\$ 6,061,165	\$ 959,377
\$ 52,309,290	\$ 174,112,752	\$ 26,499,049	\$ 26,499,049	\$ 10,772,834	\$ 1,639,569	\$ 1,639,569	\$ 19,508,334	\$ 2,969,066	\$ 2,969,066	\$ 6,061,165	\$ 922,478
\$ 50,297,394	\$ 174,112,752	\$ 25,479,855	\$ 25,479,855	\$ 10,772,834	\$ 1,576,509	\$ 1,576,509	\$ 19,508,334	\$ 2,854,871	\$ 2,854,871	\$ 6,061,165	\$ 886,998
\$ 48,362,879	\$ 174,112,752	\$ 24,499,861	\$ 24,499,861	\$ 10,772,834	\$ 1,515,874	\$ 1,515,874	\$ 19,508,334	\$ 2,745,069	\$ 2,745,069	\$ 6,061,165	\$ 852,882
\$ 46,502,768	\$ 174,112,752	\$ 23,557,558	\$ 23,557,558	\$ 10,772,834	\$ 1,457,571	\$ 1,457,571	\$ 19,508,334	\$ 2,639,489	\$ 2,639,489	\$ 6,061,165	\$ 820,079
\$ 44,714,200	\$ 174,112,752	\$ 22,651,498	\$ 22,651,498	\$ 10,772,834	\$ 1,401,510	\$ 1,401,510	\$ 19,508,334	\$ 2,537,970	\$ 2,537,970	\$ 6,061,165	\$ 788,538
\$ 42,994,423	\$ 174,112,752	\$ 21,780,287	\$ 21,780,287	\$ 10,772,834	\$ 1,347,606	\$ 1,347,606	\$ 19,508,334	\$ 2,440,356	\$ 2,440,356	\$ 6,061,165	\$ 758,209
\$ 41,340,791	\$ 174,112,752	\$ 20,942,584	\$ 20,942,584	\$ 10,772,834	\$ 1,295,775	\$ 1,295,775	\$ 19,508,334	\$ 2,346,496	\$ 2,346,496	\$ 6,061,165	\$ 729,047
\$ 39,750,761	\$ 174,112,752	\$ 20,137,100	\$ 20,137,100	\$ 10,772,834	\$ 1,245,938	\$ 1,245,938	\$ 19,508,334	\$ 2,256,246	\$ 2,256,246	\$ 6,061,165	\$ 701,007
\$ 38,221,886	\$ 174,112,752	\$ 19,362,596	\$ 19,362,596	\$ 10,772,834	\$ 1,198,017	\$ 1,198,017	\$ 19,508,334	\$ 2,169,468	\$ 2,169,468	\$ 6,061,165	\$ 674,045
\$ 36,751,813	\$ 174,112,752	\$ 18,617,881	\$ 18,617,881	\$ 10,772,834	\$ 1,151,939	\$ 1,151,939	\$ 19,508,334	\$ 2,086,027	\$ 2,086,027	\$ 6,061,165	\$ 648,121
\$ 35,338,282	\$ 174,112,752										

	Walking and Cying	Discounted	Step Change	Cost	Discounted	Subsidy (Funding Gap)	Do Min funding Gap	Increase Subsidy over Do	NPV Funding Gap
\$ 1,465,909									
\$ 1,429,481						\$ 1,749,000	\$ 1,749,000		
\$ 1,393,686				\$ 6,450,835	\$ 5,964,160	\$ 1,673,000	\$ 1,673,000		
\$ 1,358,531				\$ 6,450,835	\$ 5,734,769	\$ 2,912,000	\$ 1,706,460	\$ 1,239,000	\$ 1,101,466
\$ 1,324,018	\$ 1,983,161	\$ 1,695,214		\$ 6,450,835	\$ 5,514,201	\$ 2,843,000	\$ 1,740,589	\$ 1,170,000	\$ 1,000,121
\$ 1,290,150	\$ 2,364,028	\$ 1,943,058		\$ 39,285,030	\$ 32,289,431	\$ 2,733,000	\$ 1,775,401	\$ 1,060,000	\$ 871,243
\$ 1,256,929	\$ 2,744,894	\$ 2,169,330	\$ 111,662	\$ 32,834,195	\$ 25,949,341	\$ 4,729,000	\$ 1,810,909	\$ 3,056,000	\$ 2,415,201
\$ 1,224,354	\$ 3,125,761	\$ 2,375,322	\$ 134,948	\$ 32,834,195	\$ 24,951,289	\$ 4,618,000	\$ 1,847,127	\$ 2,945,000	\$ 2,237,958
\$ 1,192,427	\$ 3,506,628	\$ 2,562,259	\$ 156,278	\$ 32,834,195	\$ 23,991,624	\$ 4,430,000	\$ 1,884,070	\$ 2,757,000	\$ 2,014,513
\$ 1,171,153	\$ 3,887,495	\$ 2,731,302	\$ 175,767	\$ 32,834,195	\$ 23,068,870	\$ 5,725,000	\$ 1,921,751	\$ 4,052,000	\$ 2,846,881
\$ 1,149,752	\$ 4,268,362	\$ 2,883,552	\$ 193,527	\$ 32,834,195	\$ 22,181,605	\$ 5,627,000	\$ 1,960,186	\$ 3,954,000	\$ 2,671,181
\$ 1,128,265	\$ 4,649,229	\$ 3,020,050	\$ 2,413,844			\$ 5,739,540	\$ 1,999,390	\$ 4,066,540	\$ 2,641,547
\$ 1,106,730	\$ 5,030,096	\$ 3,141,783	\$ 2,582,003	\$ 101,387,325	\$ 63,326,224	\$ 5,854,331	\$ 2,039,378	\$ 4,181,331	\$ 2,611,647
\$ 1,085,182	\$ 5,410,962	\$ 3,249,684	\$ 2,733,656	\$ 101,387,325	\$ 60,890,600	\$ 5,971,417	\$ 2,080,165	\$ 4,298,417	\$ 2,581,518
\$ 2,742,513	\$ 5,791,829	\$ 3,344,637	\$ 3,344,637			\$ 6,090,846	\$ 2,121,769	\$ 4,417,846	\$ 2,551,196
\$ 2,689,069	\$ 6,172,696	\$ 3,427,479	\$ 3,427,479			\$ 6,212,663	\$ 2,164,204	\$ 4,539,663	\$ 2,520,714
\$ 2,635,679	\$ 6,553,563	\$ 3,499,001	\$ 3,499,001			\$ 6,336,916	\$ 2,207,488	\$ 4,663,916	\$ 2,490,103
\$ 2,582,418	\$ 6,934,430	\$ 3,559,951	\$ 3,559,951			\$ 6,463,654	\$ 2,251,638	\$ 4,790,654	\$ 2,459,394
\$ 2,529,355	\$ 7,315,297	\$ 3,611,036	\$ 3,611,036			\$ 6,592,927	\$ 2,296,670	\$ 4,919,927	\$ 2,428,614
\$ 2,476,553	\$ 7,696,163	\$ 3,652,926	\$ 3,652,926			\$ 6,724,786	\$ 2,342,604	\$ 5,051,786	\$ 2,397,792
\$ 2,424,072	\$ 8,077,030	\$ 3,686,251	\$ 3,686,251			\$ 6,859,282	\$ 2,389,456	\$ 5,186,282	\$ 2,366,951
\$ 2,371,964	\$ 8,457,897	\$ 3,711,609	\$ 3,711,609			\$ 6,996,467	\$ 2,437,245	\$ 5,323,467	\$ 2,336,116
\$ 2,320,278	\$ 8,838,764	\$ 3,729,564	\$ 3,729,564			\$ 7,136,397	\$ 2,485,990	\$ 5,463,397	\$ 2,305,310
\$ 2,269,060	\$ 9,219,631	\$ 3,740,647	\$ 3,740,647			\$ 7,279,125	\$ 2,535,710	\$ 5,606,125	\$ 2,274,552
\$ 2,218,349	\$ 9,600,498	\$ 3,745,360	\$ 3,745,360			\$ 7,424,707	\$ 2,586,424	\$ 5,751,707	\$ 2,243,864
\$ 2,168,182	\$ 9,981,365	\$ 3,744,178	\$ 3,744,178			\$ 7,573,201	\$ 2,638,152	\$ 5,900,201	\$ 2,213,265
\$ 2,118,593	\$ 10,362,231	\$ 3,737,545	\$ 3,737,545			\$ 7,724,665	\$ 2,690,916	\$ 6,051,665	\$ 2,182,770
\$ 2,069,610	\$ 10,743,098	\$ 3,725,884	\$ 3,725,884			\$ 7,879,158	\$ 2,744,734	\$ 6,206,158	\$ 2,152,399
\$ 2,021,262	\$ 11,123,965	\$ 3,709,592	\$ 3,709,592			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 2,122,164
\$ 1,943,521	\$ 11,123,965	\$ 3,566,915	\$ 3,566,915			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 2,040,543
\$ 1,868,770	\$ 11,123,965	\$ 3,429,726	\$ 3,429,726			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,962,060
\$ 1,796,895	\$ 11,123,965	\$ 3,297,814	\$ 3,297,814			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,886,596
\$ 1,727,783	\$ 11,123,965	\$ 3,170,975	\$ 3,170,975			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,814,035
\$ 1,661,330	\$ 11,123,965	\$ 3,049,014	\$ 3,049,014			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,744,265
\$ 1,597,433	\$ 11,123,965	\$ 2,931,744	\$ 2,931,744			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,677,177
\$ 1,535,993	\$ 11,123,965	\$ 2,818,985	\$ 2,818,985			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,612,671
\$ 1,476,916	\$ 11,123,965	\$ 2,710,562	\$ 2,710,562			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,550,645
\$ 1,420,112	\$ 11,123,965	\$ 2,606,310	\$ 2,606,310			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,491,005
\$ 1,365,492	\$ 11,123,965	\$ 2,506,067	\$ 2,506,067			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,433,658
\$ 1,312,973	\$ 11,123,965	\$ 2,409,680	\$ 2,409,680			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,378,518
\$ 1,262,474	\$ 11,123,965	\$ 2,317,000	\$ 2,317,000			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,325,498
\$ 1,213,918	\$ 11,123,965	\$ 2,227,885	\$ 2,227,885			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,274,517
\$ 1,167,228	\$ 11,123,965	\$ 2,142,197	\$ 2,142,197			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,225,497
\$ 1,122,335	\$ 11,123,965	\$ 2,059,805	\$ 2,059,805			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,178,363
\$ 1,079,168	\$ 11,123,965	\$ 1,980,581	\$ 1,980,581			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,133,041
\$ 1,037,662	\$ 11,123,965	\$ 1,904,405	\$ 1,904,405			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,089,462
\$ 997,752	\$ 11,123,965	\$ 1,831,159	\$ 1,831,159			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,047,560
\$ 959,377	\$ 11,123,965	\$ 1,760,730	\$ 1,760,730			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 1,007,269
\$ 922,478	\$ 11,123,965	\$ 1,693,009	\$ 1,693,009			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 968,528
\$ 886,998	\$ 11,123,965	\$ 1,627,894	\$ 1,627,894			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 931,277
\$ 852,882	\$ 11,123,965	\$ 1,565,282	\$ 1,565,282			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 895,459
\$ 820,079	\$ 11,123,965	\$ 1,505,079	\$ 1,505,079			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 861,018
\$ 788,538	\$ 11,123,965	\$ 1,447,191	\$ 1,447,191			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 827,902
\$ 758,209	\$ 11,123,965	\$ 1,391,530	\$ 1,391,530			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 796,060
\$ 729,047	\$ 11,123,965	\$ 1,338,010	\$ 1,338,010			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 765,442
\$ 701,007	\$ 11,123,965	\$ 1,286,548	\$ 1,286,548			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 736,002
\$ 674,045	\$ 11,123,965	\$ 1,237,065	\$ 1,237,065			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 707,694
\$ 648,121	\$ 11,123,965	\$ 1,189,486	\$ 1,189,486			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 680,475
\$ 623,193	\$ 11,123,965	\$ 1,143,736	\$ 1,143,736			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 654,303
\$ 599,224	\$ 11,123,965	\$ 1,099,747	\$ 1,099,747			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 629,137
\$ 576,177	\$ 11,123,965	\$ 1,057,449	\$ 1,057,449			\$ 8,036,742	\$ 2,799,629	\$ 6,363,742	\$ 604,940
\$ 89,340,655	\$ 519,805,956	\$ 146,700,795	\$ 129,430,924	\$ 425,583,158	\$ 293,862,114	\$ 417,111,556	\$ 150,468,166	\$ 316,655,556	\$ 95,969,096

1.000			1.000			1.000			1.000
\$ 89,340,655			\$ 129,430,924			\$ 293,862,114			\$ 95,969,096

Do Minimum Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Average Speed (kph)
2018 AM	121710	2906	42
2018 IP	97324	2109	46
2018 PM	123747	2835	44
2028 Do Min AM	146547	3760	39
2028 Do Min IP	122096	2790	44
2028 Do Min PM	154370	4003	39
2048 Do Min AM	205953	8562	24
2048 Do Min IP	169282	5643	30
2048 Do Min PM	212901	11064	19

Do Minimum				
TT Cost	VOC	CO2	Crash Cost	Bus TT
2018				
\$ 126,853,177	\$ 103,866,241	\$ 6,426,490	\$ 14,583,200	\$ 1,424,406
2028				
\$ 169,094,707	\$ 129,351,846	\$ 8,003,354	\$ 16,494,168	\$ 1,631,918
2048				
\$ 371,241,598	\$ 179,565,126	\$ 11,110,187	\$ 20,637,137	\$ 2,331,880

Package 2 Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Average Speed (kph)
2028 Package 2 AM	144875	3661	40
2028 Package 2 IP	121200	2762	44
2028 Package 2 PM	151901	3841	40
2048 Package 2 AM	199586	7870	25
2048 Package 2 IP	166057	5390	31
2048 Package 2 PM	204089	9900	21

Package 2 Summary			
Vehicle TT	VOC	CO2	Crash Cost
2028			
\$ 166,009,148	\$ 128,140,424	\$ 7,928,400	\$ 16,347,584
2048			
\$ 347,316,578	\$ 175,167,618	\$ 10,838,102	\$ 20,306,265

Package 2 + 3 Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Average Speed (kph)
2028 Package 3 AM	143578	4017	36
2028 Package 3 IP	120485	2909	41
2028 Package 3 PM	151092	4181	45
2048 Package 3 AM	199797	8381	24
2048 Package 3 IP	164315	5010	43
2048 Package 3 PM	205415	10938	19

Package 2 + 3 Summary				
Vehicle TT	VOC	CO2	Crash Cost	Bus TT
2028				
\$ 177,054,865	\$ 127,336,864	\$ 7,878,681	\$ 15,917,617	\$ 4,186,852
2048				
\$ 343,699,665	\$ 174,112,752	\$ 10,772,834	\$ 19,508,334	\$ 6,061,165

TT and VOC		
Item	Value	Source and Assumptions
TT \$/hr	16.27	Table 17 Urban Arterial all periods
VOC cents/km	29.6	Table A72 35kph and 0% gradient
Generalised Day	245	
Weekdays	245	
Other days	120	
Assume 0% traffic on other days	0	

Peak to AADT Factor	
Peak	Factor
AM	1.87
IP	10
PM	1.87

Table A72: LCV VOC by speed and gradient (cents/km – July 2015)

Speed (km/h)	Gradient in percent (both directions)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
10	44.2	44.2	44.3	44.3	44.5	44.7	44.9	45.2	45.6	46.1	46.7	47.3	48.1
15	39.2	39.3	39.4	39.5	39.8	40.0	40.4	40.8	41.4	42.0	42.7	43.5	44.4
20	35.5	35.6	35.7	35.9	36.2	36.6	37.0	37.5	38.1	38.8	39.6	40.5	41.5
25	32.9	33.0	33.1	33.3	33.6	34.0	34.5	35.0	35.7	36.4	37.3	38.3	39.4
30	30.9	31.0	31.2	31.4	31.8	32.2	32.7	33.2	33.9	34.7	35.7	36.7	37.8
35	29.6	29.7	29.8	30.1	30.4	30.8	31.4	32.0	32.7	33.5	34.5	35.6	36.8
40	28.6	28.7	28.9	29.2	29.5	29.9	30.5	31.1	31.8	32.7	33.7	34.8	36.0
45	28.0	28.1	28.3	28.5	28.9	29.3	29.9	30.5	31.3	32.2	33.2	34.3	35.6
50	27.6	27.7	27.9	28.2	28.5	29.0	29.5	30.2	31.0	31.9	32.9	34.1	35.4
55	27.5	27.6	27.8	28.0	28.4	28.8	29.4	30.1	30.9	31.8	32.8	34.0	35.3
60	27.5	27.6	27.8	28.0	28.4	28.9	29.4	30.1	30.9	31.9	32.9	34.1	35.5
65	27.7	27.8	27.9	28.2	28.6	29.0	29.6	30.3	31.1	32.0	33.1	34.3	35.7
70	28.0	28.0	28.2	28.5	28.8	29.3	29.9	30.6	31.4	32.3	33.4	34.7	36.0
75	28.3	28.4	28.6	28.8	29.2	29.7	30.2	30.9	31.8	32.7	33.8	35.1	36.4
80	28.8	28.9	29.0	29.3	29.6	30.1	30.7	31.4	32.2	33.2	34.3	35.5	36.9
85	29.3	29.4	29.5	29.8	30.1	30.6	31.2	31.9	32.7	33.7	34.8	36.1	37.5
90	29.9	30.0	30.1	30.4	30.7	31.2	31.8	32.5	33.3	34.3	35.4	36.7	38.1
95	30.5	30.6	30.7	31.0	31.3	31.8	32.4	33.1	34.0	34.9	36.1	37.3	38.8
100	31.2	31.3	31.4	31.7	32.0	32.5	33.1	33.8	34.6	35.6	36.7	38.0	39.5
105	31.9	32.0	32.1	32.4	32.7	33.2	33.8	34.5	35.3	36.3	37.5	38.8	40.2
110	32.7	32.7	32.9	33.1	33.4	33.9	34.5	35.2	36.1	37.1	38.2	39.5	41.0
115	33.5	33.5	33.6	33.9	34.2	34.7	35.3	36.0	36.8	37.8	39.0	40.3	41.7
120	34.3	34.3	34.4	34.7	35.0	35.5	36.1	36.8	37.6	38.6	39.8	41.1	42.5

Road links

For road links, vehicle operating costs (VOC, 2015 base date) are calculated by summing running costs and roughness costs. The fuel cost component of running costs is approximately 50%, while for roughness costs the fuel cost component is negligible.

CO2		
Item	Value	Source and Assumptions
LV CO2	0.0009	MBCM
HCV CO2	0.0016	MBCM
Generalised CO2	0.000943	
CO2 value/ton	\$65.58	MBCM
LV%	94%	Average observation from model
HCV%	6%	Average observation from model

The following formulae can be used to determine CO₂ emissions:

- light vehicle CO₂ (in tonnes) = VOC(\$)^{0.0009}
- heavy vehicle CO₂ (in tonnes) = VOC(\$)^{0.0018}

The value of NZ\$65.58 per tonne of CO₂ (as at June 2016) should be used for project evaluation. This is based on the [Austroads \(2012\)](#) value.

CAS average crash per year (2014 - 2018)				
Fatal injury	Serious injury	Minor injury	Non-injury	Source and Assumptions
1	16	56	357	CAS Database

Crash Cost for all vehicle, all movement and 50km/hr				
Fatal injury	Serious injury	Minor injury	Non-injury	Source and Assumptions
\$ 4,600,000	\$ 475,000	\$ 28,000	\$ 2,800	Table A20, A21, A22 and A23

	Do Minimum								
	AM			IP			PM		
Years	2018	2028	2048	2018	2028	2048	2018	2028	2048
LV	12449	13296	15864	11139	12588	15727	13153	14779	18413
HCV	804	1025	1405	902	1166	1609	387	486	653
Total	13253	14321	17269	12041	13753	17336	13540	15265	19065

	Walking Cycling and PT Service Improvements								
	AM			IP			PM		
Years	2018	2028	2048	2018	2028	2048	2018	2028	2048
LV	12449	13114	15453	11139	12491	15509	13153	14561	17921
HCV	804	1025	1405	902	1166	1609	387	486	653
Total	13253	14139	16858	12041	13657	17117	13540	15047	18574

	Priority Lanes								
	AM			IP			PM		
Years	2018	2028	2048	2018	2028	2048	2018	2028	2048
LV	12449	12610	14481	11139	12176	14919	13153	14064	17057
HCV	804	1025	1405	902	1166	1609	387	486	653
Total	13253	13635	15886	12041	13341	16528	13540	14550	17709

Do Minimum AADT		
2018	2028	2048
170515	192859	241301

Walking and Cycling, PT Service Improvements		
2018	2028	2048
170515	191145	237432

Preferred Option Including Priority Lanes		
2018	2028	2048
170515	186117	228102

Walking and Cycling Project Cost						
Projects	Project Expected Estimate	95th percentile Project Estimate	NPV	95th NPV	Construction Period	Separate Spreadsheet
Bisley Av / Tahunanui Drive Southbound Merge	\$ 271,679	\$ 337,973	\$ 261,230	\$ 324,974	2022 - end of 2024	Cost_Bisley_Tahunanui Intersection DBE May 2021.xls
Franklyn Road / Motueka St Signalised Intersection	\$ 1,578,857	\$ 1,921,823	\$ 1,518,132	\$ 1,847,906	2022 - end of 2024	Cost_Franklyn_Waimea signalised intersection DBE May 2021.xls
Muratai St Crossing	\$ 342,181	\$ 422,083	\$ 329,020	\$ 405,849	2022 - end of 2024	Cost_Muratai Street Crossing DBE May 2021.xls
Railway Reserve to Waimea Road Walking and Cycling Facility and	\$ 10,857,759	\$ 13,321,040	\$ 10,440,152	\$ 12,808,693	2022 - end of 2024	Cost_Railway Reserve to Waimea Road DBE May 2021.xls
Tahunanui / Parkers / Maire signalised intersection	\$ 3,397,413	\$ 4,181,196	\$ 3,266,743	\$ 4,020,381	2022 - end of 2024	Cost_Tahunanui_Parkers_Maire signalised intersection DBE May 2021.xls
Washington Road	\$ 9,355,452	\$ 11,300,923	\$ 8,995,627	\$ 10,866,272	2022 - end of 2024	
Remaining Walking and Cycling preferred option years 4-10 WK	\$ 2,227,160	\$ 2,645,860	\$ 2,141,500	\$ 2,544,096	2025 - end of 2030	Cost_Short term (Yrs 4-10) preferred programme WK.xls
Remaining Walking and Cycling preferred option years 4-10 NCC	\$ 56,786,438	\$ 67,431,906	\$ 54,602,344	\$ 64,838,371	2025 - end of 2030	Cost_short term (Yrs 4-10) preferred programme NCC.xls
Rocks Road	\$ 137,991,570	\$ 164,432,570	\$ 103,099,245	\$ 158,108,240	2025 - end of 2030	Cost_Rocks Road DBE May 2021 after Monte Carlo V2.xls
Total Walking and Cycling	\$ 222,808,508	\$ 265,995,374	\$ 184,653,993	\$ 255,764,783	N/A	

Priority Lanes Project Cost						
Projects	Project Expected Estimate	95th percentile Project Estimate	NPV	95th NPV	Construction Period	Separate Spreadsheet
Remaining preferred option years 11-30 WK	\$ 14,103,895	\$ 16,732,383	\$ 13,561,438	\$ 16,088,829	2032 - end of 2033	Cost_remaining preferred (yrs 11-30) IBE WK Projects
Remaining preferred option years 11-30 NCC	\$ 52,635,700	\$ 62,621,950	\$ 50,611,250	\$ 60,213,413	2032 - end of 2033	Cost_Remaining preferred programme yrs 11-30 IBE NCC Projects
Priority Lanes WK	\$ 40,903,200	\$ 49,517,100	\$ 39,330,000	\$ 47,612,596	2032 - end of 2033	Cost_Priority Lanes IBE WK .xls

Priority Lanes NCC	\$	95,131,855	\$	114,756,043	\$	91,472,938	\$	110,342,349	2032 - end of 2033	Cost_Priority Lanes NCC .xls
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Preferred Option Including Priority Lanes Project Cost						
Projects	Project Expected Estimate	95th percentile Project Estimate	NPV	95th NPV	Construction Period	Separate Spreadsheet
Total Preferred Option Including Priority Lanes	\$ 425,583,158	\$ 509,622,849	\$ 379,629,618	\$ 490,021,971	N/A	

Year	Discount Rate
1	0.9615
2	0.9246
3	0.8890

Bus Patronage									
Peak	AM			IP			PM		
Years	2018	2028	2048	2018	2028	2048	2018	2028	2048
Do Min	221	233	260	118	124	138	265	278	311
Package 3	221	609	646	118	371	475	265	684	726

Do Minimum Bus Route Travel Time									
	2018			2028			2048		
	AM (min)	IP (min)	PM (min)	AM (min)	IP (min)	PM (min)	AM (min)	IP (min)	PM (min)
Bus - Route 1 - NB	29	24	25	34	26	29	47	33	34
Bus - Route 1 - SB	25	23	25	28	25	31	37	29	52
Bus - Route 2 - NB	32	27	28	35	29	30	44	35	34
Bus - Route 2 - SB	27	26	29	30	28	33	34	34	63
Average	29	25	27	32	27	31	41	33	46

Preferred Option Including Priority Lanes Bus Route Travel Time									
	2018			2028			2048		
	AM (min)	IP (min)	PM (min)	AM (min)	IP (min)	PM (min)	AM (min)	IP (min)	PM (min)
Bus - Route 1 - NB	29	24	25	31	26	28	39	31	35
Bus - Route 1 - SB	25	23	25	27	25	28	35	30	40
Bus - Route 2 - NB	32	27	28	33	29	30	39	34	32
Bus - Route 2 - SB	27	26	29	30	29	34	33	34	58
Average	29	25	27	30	27	30	37	32	41

Total Bus Travel Time (hr)									
Peak	AM			IP			PM		
Years	2018	2028	2048	2018	2028	2048	2018	2028	2048
Do Minimum	115	134	189	58	64	86	127	153	252
Preferred Option	115	319	406	58	177	266	127	349	512

Total Daily Bus Travel Time (hr)			
Peak	2018	2028	2048
Do Minimum	1029	1179	1685
Preferred Option	1029	3025	4379

Total Daily Bus Travel Time (hr)			
Peak	2018	2028	2048
Do Minimum	\$ 1,424,406	\$ 1,631,918	\$ 2,331,880
Preferred Option	\$ 1,424,406	\$ 4,186,852	\$ 6,061,165

Table 14: Behavioural values of time for mode user for transport modelling purposes (\$/h – July 2002)

Mode user	Work travel purpose	Commuting to/from work	Other non-work travel purposes
Base values of time for uncongested traffic (\$/h)			
Car, motorcycle driver	23.85	7.80	6.90
Car, motorcycle passenger	21.70	5.85	5.20
Light commercial driver	23.45	7.80	6.90
Light commercial passenger	21.70	5.85	5.20
Medium/heavy commercial driver	20.10	7.80	6.90
Medium/heavy commercial passenger	20.10	5.85	5.20
Seated bus and train passenger	21.70	4.70	3.05
Standing bus and train passenger	21.70	6.60	4.25
Pedestrian and cyclist	21.70	6.60	4.25
Maximum increment for congestion (CRV, \$/h)			
Car, motorcycle driver	3.15		2.75
Car, motorcycle passenger	2.35		2.05
Commercial vehicle driver	3.15		2.75
Commercial vehicle passenger	2.35		2.05

Assumptions	
Description	Value
Wait time of 10 mins	10
Total additional walk time of 10 mins	10
Seated bus passenger cost (\$/hr)	\$ 4.7
Standing bus passenger cost (\$/hr)	\$ 6.6
Average bus passenger cost (\$/hr)	\$ 5.7

Walking, Cycling Improvements			
Project	New Users	Benefits	Separate Spreadsheet
Rocks Road (2048) - Cycling	2090	\$ 5,016,000	Demand_Rocks Road.xlsx
Rocks Road (2048) - Walking	947	\$ 1,183,750	Demand_Rocks Road.xlsx
Other Projects (2028)	1026	\$ 2,462,400	Demand_Biking.xlsx
Other Projects (2048)	1925	\$ 4,620,000	Demand_Biking.xlsx
2028 Total		\$ 2,462,400	
2048 Total		\$ 10,819,750	

Preferred Option Including Priority Lanes - Walking, Cycling Improvements (table above) + Priority Lanes (mode shift)			
Project	New Users	Benefits	Source
Walking, Cycling Improvements 2028 Total	1461	\$ 3,506,628	From modelling output
Walking, Cycling Improvements 2048 Total	5102	\$ 11,123,965	From modelling output
Walking, Cycling Improvements 2048 - Cycling	4128	\$ 9,906,932	From modelling output
Walking, Cycling Improvements 2048 - Walking	974	\$ 1,217,033	From modelling output

Table 9: New pedestrian facility benefits (\$/pedestrian km – 2018)

Benefit	Health benefits for new user (\$/km)	Maximum annual benefit per new user (2018 \$)
Composite benefit	\$4.40	\$1,250

Table 10: New cycle facility benefits (\$/cyclist km – 2018)

Benefit	Health benefits for new user (\$/km)	Maximum annual benefit per new user (2018 \$)
Conventional cycling	\$2.20	\$2,500
Electric-assisted cycling	\$1.00	\$2,000

Source: [Waka Kotahi NZ Transport Agency \(2020a\)](#)

Assumed New Con. Cyclist	Assumed New Elec. Cyclist
80%	20%

New Con. Cyclist Benefit	New Elec. Cyclist Benefit	New Cyclist Benefit	New Pedestrian Benefit
\$ 2,500.00	\$ 2,000.00	\$ 2,400.00	\$ 1,250.00

BCR Summaries

Total NPV Cost					
Package	Car + Bus Travel Time (\$M)	Vehicle Operation Cost (\$M)	CO2 Cost (\$M)	Crash Cost (\$M)	Project Cost (\$M)
Do Minimum	9,261.6	3,850.7	216.6	427.0	-
Preferred Option Including Priority Lanes	8,868.5	3,775.5	212.4	413.2	384.2

Total NPV Benefits						
Package	Car + Bus Travel Time (\$M)	Vehicle Operation (\$M)	CO2 (\$M)	Crash (\$M)	Health Benefits (\$M)	BCR
Preferred Option Including Priority Lanes	393.1	75.2	4.2	13.8	129.5	1.6

BCR Summaries

Total NPV Cost					
Package	Car + Bus Travel Time (\$M)	Vehicle Operation Cost (\$M)	CO2 Cost (\$M)	Crash Cost (\$M)	Project Cost (\$M)
Do Minimum	9,261.6	3,850.7	216.6	427.0	-
Preferred Option	8,868.5	3,775.5	212.4	413.2	384.2

Sensitivity Test							
Package	Car + Bus Travel Time (\$M)	Vehicle Operation (\$M)	CO2 (\$M)	Crash (\$M)	Health Benefits (\$M)	Project Cost (\$M)	BCR
Preferred Option	393.1	75.2	4.2	13.8	129.5	384.2	1.6
3% Discount Rate	523.7	101.7	5.7	18.7	176.1	440.3	1.9
6% Discount Rate	204.9	45.4	2.6	8.1	74.5	303.2	1.1
40 Years Analysis Period	267.0	59.2	3.3	10.7	98.4	366.6	1.2
Project Benefit Delay by 3 Year	404.5	70.9	4.0	12.6	120.9	384.2	1.6
Project Benefit Delay by 5 Year	410.7	69.0	3.9	11.8	114.5	384.2	1.6
Car + Bus Travel Time Benefit +20%	471.7	75.2	4.2	13.8	129.5	384.2	1.8
Car + Bus Travel Time Benefit -20%	314.4	75.2	4.2	13.8	129.5	384.2	1.4
Vehicle Operation Benefit +20%	393.1	90.3	4.2	13.8	129.5	384.2	1.6
Vehicle Operation Benefit -20%	393.1	60.2	4.2	13.8	129.5	384.2	1.6
CO2 Benefit +20%	393.1	75.2	5.1	13.8	129.5	384.2	1.6
CO2 Benefit -20%	393.1	75.2	3.4	13.8	129.5	384.2	1.6
Crash Benefit +20%	393.1	75.2	4.2	16.5	129.5	384.2	1.6
Crash Benefit -20%	393.1	75.2	4.2	11.0	129.5	384.2	1.6
Health Benefit +20%	393.1	75.2	4.2	13.8	155.3	384.2	1.7
Health Benefit -20%	393.1	75.2	4.2	13.8	103.6	384.2	1.5
Project Cost +20%	393.1	75.2	4.2	13.8	129.5	461.0	1.3
Project Cost -20%	393.1	75.2	4.2	13.8	129.5	307.3	2.0

Key	
Increase compared to preferred option	
Decrease compared to preferred option	

Assumption	
% Change	Factor
+20%	1.2
-20%	0.8

2 Rocks Road Economics

Year	Health (Cycle + Ped)		Safety		veh/year less	tons CO2	Emissions		Travel time benefits (decongestion)		
	Undisc	Disc	Undisc	Disc			Undisc	Disc	Undisc	Disc	
2018	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -	
2019	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -	
2020	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -	
Year 0	2021	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 1	2022	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 2	2023	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 3	2024	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 4	2025	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 5	2026	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 6	2027	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 7	2028	\$ -	\$ -	\$ -	\$ -	0	0	\$ -	\$ -	\$ -	\$ -
Year 8	2029	\$ 1,420,850	\$ 1,038,201	\$ -	\$ -	479	84	\$ 5,541	\$ 4,049	\$ 79,387	\$ 58,007
Year 9	2030	\$ 1,705,000	\$ 1,197,910	\$ -	\$ -	575	101	\$ 6,652	\$ 4,673	\$ 96,649	\$ 67,904
Year 10	2031	\$ 2,017,000	\$ 1,362,613	\$ -	\$ -	680	120	\$ 7,866	\$ 5,314	\$ 115,893	\$ 78,293
Year 11	2032	\$ 2,361,650	\$ 1,534,083	\$ -	\$ -	796	140	\$ 9,208	\$ 5,982	\$ 137,528	\$ 89,335
Year 12	2033	\$ 2,740,100	\$ 1,711,458	\$ -	\$ -	924	163	\$ 10,689	\$ 6,676	\$ 161,802	\$ 101,061
Year 13	2034	\$ 3,156,100	\$ 1,895,472	\$ -	\$ -	1064	188	\$ 12,309	\$ 7,392	\$ 188,799	\$ 113,388
Year 14	2035	\$ 3,384,650	\$ 1,954,551	\$ -	\$ -	1141	201	\$ 13,199	\$ 7,622	\$ 205,153	\$ 118,471
Year 15	2036	\$ 3,625,300	\$ 2,013,000	\$ -	\$ -	1222	216	\$ 14,136	\$ 7,849	\$ 222,597	\$ 123,600
Year 16	2037	\$ 3,876,800	\$ 2,069,855	\$ -	\$ -	1307	231	\$ 15,120	\$ 8,073	\$ 241,158	\$ 128,756
Year 17	2038	\$ 4,141,650	\$ 2,126,212	\$ -	\$ -	1396	246	\$ 16,149	\$ 8,291	\$ 260,865	\$ 133,921
Year 18	2039	\$ 4,419,750	\$ 2,181,713	\$ -	\$ -	1490	263	\$ 17,237	\$ 8,509	\$ 281,934	\$ 139,171
Year 19	2040	\$ 4,595,100	\$ 2,181,029	\$ -	\$ -	1549	273	\$ 17,919	\$ 8,505	\$ 296,763	\$ 140,856
Year 20	2041	\$ 4,775,250	\$ 2,179,362	\$ -	\$ -	1610	284	\$ 18,625	\$ 8,500	\$ 312,257	\$ 142,510
Year 21	2042	\$ 4,962,700	\$ 2,177,800	\$ -	\$ -	1673	295	\$ 19,354	\$ 8,493	\$ 328,431	\$ 144,127
Year 22	2043	\$ 5,152,550	\$ 2,174,146	\$ -	\$ -	1737	306	\$ 20,094	\$ 8,479	\$ 345,101	\$ 145,617
Year 23	2044	\$ 5,350,850	\$ 2,170,981	\$ -	\$ -	1804	318	\$ 20,869	\$ 8,467	\$ 362,674	\$ 147,147
Year 24	2045	\$ 5,552,800	\$ 2,166,267	\$ -	\$ -	1872	330	\$ 21,656	\$ 8,448	\$ 380,767	\$ 148,545
Year 25	2046	\$ 5,763,200	\$ 2,161,873	\$ -	\$ -	1943	343	\$ 22,477	\$ 8,432	\$ 399,796	\$ 149,970
Year 26	2047	\$ 5,977,250	\$ 2,155,930	\$ -	\$ -	2015	355	\$ 23,310	\$ 8,408	\$ 419,367	\$ 151,261
Year 27	2048	\$ 6,199,750	\$ 2,150,176	\$ -	\$ -	2090	369	\$ 24,178	\$ 8,385	\$ 439,907	\$ 152,567
Year 28	2049	\$ 6,199,750	\$ 2,067,477	\$ -	\$ -	2090	369	\$ 24,178	\$ 8,063	\$ 439,907	\$ 146,699
Year 29	2050	\$ 6,199,750	\$ 1,987,959	\$ -	\$ -	2090	369	\$ 24,178	\$ 7,753	\$ 439,907	\$ 141,057
Year 30	2051	\$ 6,199,750	\$ 1,911,499	\$ -	\$ -	2090	369	\$ 24,178	\$ 7,454	\$ 439,907	\$ 135,631
Year 31	2052	\$ 6,199,750	\$ 1,837,979	\$ -	\$ -	2090	369	\$ 24,178	\$ 7,168	\$ 439,907	\$ 130,415
Year 32	2053	\$ 6,199,750	\$ 1,767,288	\$ -	\$ -	2090	369	\$ 24,178	\$ 6,892	\$ 439,907	\$ 125,399
Year 33	2054	\$ 6,199,750	\$ 1,699,315	\$ -	\$ -	2090	369	\$ 24,178	\$ 6,627	\$ 439,907	\$ 120,576
Year 34	2055	\$ 6,199,750	\$ 1,633,957	\$ -	\$ -	2090	369	\$ 24,178	\$ 6,372	\$ 439,907	\$ 115,938
Year 35	2056	\$ 6,199,750	\$ 1,571,113	\$ -	\$ -	2090	369	\$ 24,178	\$ 6,127	\$ 439,907	\$ 111,479
Year 36	2057	\$ 6,199,750	\$ 1,510,685	\$ -	\$ -	2090	369	\$ 24,178	\$ 5,891	\$ 439,907	\$ 107,191
Year 37	2058	\$ 6,199,750	\$ 1,452,582	\$ -	\$ -	2090	369	\$ 24,178	\$ 5,665	\$ 439,907	\$ 103,069
Year 38	2059	\$ 6,199,750	\$ 1,396,713	\$ -	\$ -	2090	369	\$ 24,178	\$ 5,447	\$ 439,907	\$ 99,105
Year 39	2060	\$ 6,199,750	\$ 1,342,994	\$ -	\$ -	2090	369	\$ 24,178	\$ 5,237	\$ 439,907	\$ 95,293
Year 40	2061	\$ 6,199,750	\$ 1,291,340	\$ -	\$ -	2090	369	\$ 24,178	\$ 5,036	\$ 439,907	\$ 91,628
Year 41	2062	\$ 6,199,750	\$ 1,241,673	\$ -	\$ -	2090	369	\$ 24,178	\$ 4,842	\$ 439,907	\$ 91,628
Year 42	2063	\$ 6,199,750	\$ 1,193,916	\$ -	\$ -	2090	369	\$ 24,178	\$ 4,656	\$ 439,907	\$ 91,628
Year 43	2064	\$ 6,199,750	\$ 1,147,997	\$ -	\$ -	2090	369	\$ 24,178	\$ 4,477	\$ 439,907	\$ 91,628
Year 44	2065	\$ 6,199,750	\$ 1,103,843	\$ -	\$ -	2090	369	\$ 24,178	\$ 4,305	\$ 439,907	\$ 91,628
Year 45	2066	\$ 6,199,750	\$ 1,061,387	\$ -	\$ -	2090	369	\$ 24,178	\$ 4,139	\$ 439,907	\$ 91,628
Year 46	2067	\$ 6,199,750	\$ 1,020,565	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,980	\$ 439,907	\$ 91,628
Year 47	2068	\$ 6,199,750	\$ 981,312	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,827	\$ 439,907	\$ 91,628
Year 48	2069	\$ 6,199,750	\$ 943,569	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,680	\$ 439,907	\$ 91,628
Year 49	2070	\$ 6,199,750	\$ 907,278	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,538	\$ 439,907	\$ 91,628
Year 50	2071	\$ 6,199,750	\$ 872,383	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,402	\$ 439,907	\$ 91,628
Year 51	2072	\$ 6,199,750	\$ 838,830	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,271	\$ 439,907	\$ 91,628
Year 52	2073	\$ 6,199,750	\$ 806,567	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,145	\$ 439,907	\$ 91,628
Year 53	2074	\$ 6,199,750	\$ 775,545	\$ -	\$ -	2090	369	\$ 24,178	\$ 3,024	\$ 439,907	\$ 91,628
Year 54	2075	\$ 6,199,750	\$ 745,717	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,908	\$ 439,907	\$ 91,628
Year 55	2076	\$ 6,199,750	\$ 717,035	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,796	\$ 439,907	\$ 91,628
Year 56	2077	\$ 6,199,750	\$ 689,457	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,689	\$ 439,907	\$ 91,628
Year 57	2078	\$ 6,199,750	\$ 662,939	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,585	\$ 439,907	\$ 91,628
Year 58	2079	\$ 6,199,750	\$ 637,442	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,486	\$ 439,907	\$ 91,628
Year 59	2080	\$ 6,199,750	\$ 612,925	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,390	\$ 439,907	\$ 91,628
Year 60	2081	\$ 6,199,750	\$ 589,351	\$ -	\$ -	2090	369	\$ 24,178	\$ 2,298	\$ 439,907	\$ 91,628
Total	\$	\$ 285,770,050	\$ 77,623,265	\$ -	\$ -	\$ 96,337	\$ 16,994	\$ 1,114,456	\$ 302,721	\$ 19,793,749	\$ 5,830,544

Undisc Total	\$	311,880,043
Disc Total	\$	85,320,159
Undisc Cost	\$	52,154,628
Cost Total	\$	78,966,507
BCR		1.1

	Year	Growth Rate %	Growth Factor	Cyclist	New Cyclist	Cyclist Benefits	Pedestrians	New Pedestrain	Pedestrain Benefits
	2018	0%	1.000	479	479	0 \$	-	217	0 \$
	2019	0%	1.000	479	479	0 \$	-	217	0 \$
	2020	0%	1.000	479	479	0 \$	-	217	0 \$
Year 0	2021	0%	1.000	479	479	0 \$	-	217	0 \$
Year 1	2022	0%	1.000	479	479	0 \$	-	217	0 \$
Year 2	2023	0%	1.000	479	479	0 \$	-	217	0 \$
Year 3	2024	0%	1.000	479	479	0 \$	-	217	0 \$
Year 4	2025	0%	1.000	479	479	0 \$	-	217	0 \$
Year 5	2026	0%	1.000	479	479	0 \$	-	217	0 \$
Year 6	2027	0%	1.000	479	479	0 \$	-	217	0 \$
Year 7	2028	0%	1.000	479	479	0 \$	-	217	0 \$
Year 8	2029	100%	2.000	958	479	1,149,600 \$	434	217	271,250 \$
Year 9	2030	10%	2.200	1054	575	1,380,000 \$	477	260	325,000 \$
Year 10	2031	10%	2.420	1159	680	1,632,000 \$	525	308	385,000 \$
Year 11	2032	10%	2.662	1275	796	1,910,400 \$	578	361	451,250 \$
Year 12	2033	10%	2.928	1403	924	2,217,600 \$	635	418	522,500 \$
Year 13	2034	10%	3.221	1543	1064	2,553,600 \$	699	482	602,500 \$
Year 14	2035	5%	3.382	1620	1141	2,738,400 \$	734	517	646,250 \$
Year 15	2036	5%	3.551	1701	1222	2,932,800 \$	771	554	692,500 \$
Year 16	2037	5%	3.729	1786	1307	3,136,800 \$	809	592	740,000 \$
Year 17	2038	5%	3.915	1875	1396	3,350,400 \$	850	633	791,250 \$
Year 18	2039	5%	4.111	1969	1490	3,576,000 \$	892	675	843,750 \$
Year 19	2040	3%	4.234	2028	1549	3,717,600 \$	919	702	877,500 \$
Year 20	2041	3%	4.361	2089	1610	3,864,000 \$	946	729	911,250 \$
Year 21	2042	3%	4.492	2152	1673	4,015,200 \$	975	758	947,500 \$
Year 22	2043	3%	4.627	2216	1737	4,168,800 \$	1004	787	983,750 \$
Year 23	2044	3%	4.766	2283	1804	4,329,600 \$	1034	817	1,021,250 \$
Year 24	2045	3%	4.909	2351	1872	4,492,800 \$	1065	848	1,060,000 \$
Year 25	2046	3%	5.056	2422	1943	4,663,200 \$	1097	880	1,100,000 \$
Year 26	2047	3%	5.208	2494	2015	4,836,000 \$	1130	913	1,141,250 \$
Year 27	2048	3%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 28	2049	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 29	2050	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 30	2051	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 31	2052	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 32	2053	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 33	2054	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 34	2055	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 35	2056	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 36	2057	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 37	2058	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 38	2059	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 39	2060	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 40	2061	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 41	2062	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 42	2063	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 43	2064	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 44	2065	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 45	2066	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 46	2067	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 47	2068	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 48	2069	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 49	2070	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 50	2071	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 51	2072	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 52	2073	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 53	2074	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 54	2075	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 55	2076	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 56	2077	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 57	2078	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 58	2079	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 59	2080	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$
Year 60	2081	0%	5.364	2569	2090	5,016,000 \$	1164	947	1,183,750 \$

Note: Growth rate % are based on similar projects/environments, check assumptions for more detail.

Do-minimum 2020		Fatal Crash	Serious Crash
3	Number of years of typical crash rate records		5
4	Number of reported crashes over period	0	2
5	Fatal/serious severity ratio	0.1	0.9
6	Number of reported crashes adjusted by severity (4) x (5)	0.1	2
7	Crashes per year = (6) / (3)	0.0	0.4
8	Adjustment factor for crash trend		0.9
9	Adjusted crashes per year = (7) x (8)	0.0	0.3
10	Under-reporting factors	1	1.7
11	Total estimated crashes per year = (9) x (10)	0.0	0.6
12	Crash cost, 100km/h limit	\$4,100,000	\$465,000
13	Crash cost, 50km/h limit	\$4,100,000	\$435,000
14	Mean speed adjustment = ((1) - 50)/50		0
15	Cost per crash = (13) + (14) x [(12) - (13)]	\$4,100,000	\$435,000
16	Crash cost per year = (11) x (15)	\$103,320	\$247,585
17	Total cost of crashes per year (sum of columns in row (16) fatal + serious + minor + non-injury)		\$368

Option 2020		Fatal Crash	Serious Crash
18	Percentage crash reduction	0%	0%
19	Percentage of crashes 'remaining' [100 - (18)]	100%	100%
20	Predicted crashes per year (11) x (19)	0.0	0.6
21	Crash cost, 100km/h limit	\$4,100,000	\$465,000
22	Crash cost, 50km/h limit	\$4,100,000	\$435,000
23	Mean speed adjustment = ((2) - 50)/50		0
24	Cost per crash = (22) + (23) x [(21) - (22)]	\$4,100,000	\$435,000
25	Crash cost per year = (20) x (24)	\$103,320	\$247,585
26	Total cost of crashes per year (sum of columns in row (25) fatal + serious + minor + non-injury)		\$368
27	Annual crash cost savings = (17) - (26)		\$

Do-minimum 2048		Fatal Crash	Serious Crash
3	Number of years of typical crash rate records		5
4	Number of reported crashes over period	0	2
5	Fatal/serious severity ratio	0.1	0.9
6	Number of reported crashes adjusted by severity (4) x (5)	0.1	1.9
7	Crashes per year = (6) / (3)	0.0	0.4
8	Adjustment factor for crash trend		0.9
9	Adjusted crashes per year = (7) x (8)	0.0	0.3
10	Under-reporting factors	1	1.7
11	Total estimated crashes per year = (9) x (10)	0.0	0.9
12	Crash cost, 100km/h limit	\$4,100,000	\$465,000
13	Crash cost, 50km/h limit	\$4,100,000	\$435,000
14	Mean speed adjustment = ((1) - 50)/50		0
15	Cost per crash = (13) + (14) x [(12) - (13)]	\$4,100,000	\$435,000
16	Crash cost per year = (11) x (15)	\$171,989	\$412,136
17	Total cost of crashes per year (sum of columns in row (16) fatal + serious + minor + non-injury)		\$612

Option 2048		Fatal Crash	Serious Crash
18	Percentage crash reduction	0%	0%
19	Percentage of crashes 'remaining' [100 - (18)]	100%	100%
20	Predicted crashes per year (11) x (19)	0.0	0.9
21	Crash cost, 100km/h limit	\$4,100,000	\$465,000
22	Crash cost, 50km/h limit	\$4,100,000	\$435,000
23	Mean speed adjustment = ((2) - 50)/50		0
24	Cost per crash = (22) + (23) x [(21) - (22)]	\$4,100,000	\$435,000
25	Crash cost per year = (20) x (24)	\$171,989	\$412,136
26	Total cost of crashes per year (sum of columns in row (25) fatal + serious + minor + non-injury)		\$612
27	Annual crash cost savings = (17) - (26)		\$

Minor Crash	Non-Injury Crash
1	1
1	1
1	1
0	0.2
0.2	0.2
3.6	7
0.6	1.3
\$25,000	\$1,700
\$24,000	\$1,400
\$24,000	\$1,400
\$15,552	\$1,764

Minor Crash	Non-Injury Crash
0%	0%
100%	100%
0.6	1.3
\$25,000	\$1,700
\$24,000	\$1,400
\$24,000	\$1,400
\$15,552	\$1,764

Minor Crash	Non-Injury Crash
1	1
1	1
1	1
0.2	0.2
0.2	0.2
3.6	7
1.1	2.1
\$25,000	\$1,700
\$24,000	\$1,400
\$24,000	\$1,400
\$25,888	\$2,936

Minor Crash	Non-Injury Crash
0%	0%
100%	100%
1.1	2.1
\$25,000	\$1,700
\$24,000	\$1,400
\$24,000	\$1,400
\$25,888	\$2,936

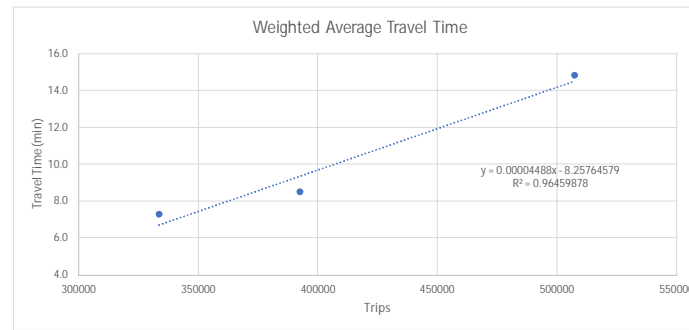
Year	Linear	Final
2018	\$	-
2019	\$	-
2020	\$	-
Year 0	\$	-
Year 1	\$	-
Year 2	\$	-
Year 3	\$	-
Year 4	\$	-
Year 5	\$	-
Year 6	\$	-
Year 7	\$	-
Year 8	\$	-
Year 9	\$	-
Year 10	\$	-
Year 11	\$	-
Year 12	\$	-
Year 13	\$	-
Year 14	\$	-
Year 15	\$	-
Year 16	\$	-
Year 17	\$	-
Year 18	\$	-
Year 19	\$	-
Year 20	\$	-
Year 21	\$	-
Year 22	\$	-
Year 23	\$	-
Year 24	\$	-
Year 25	\$	-
Year 26	\$	-
Year 27	\$	-
Year 28	\$	-
Year 29	\$	-
Year 30	\$	-
Year 31	\$	-
Year 32	\$	-
Year 33	\$	-
Year 34	\$	-
Year 35	\$	-
Year 36	\$	-
Year 37	\$	-
Year 38	\$	-
Year 39	\$	-
Year 40	\$	-

	2018 AM	2018 IP	2018 PM	2028 AM	2028 IP	2028 PM	2048 AM	2048 IP	2048 PM
Total Travel Time	3882	2109	3798	4756	3706	4974	10823	6910	12506
Total Trips Loaded	27882	24939	27823	31904	29855	33108	40444	38988	43122
Total Travel Distance	189304	160879	191577	228530	196575	234854	328432	276492	329766
Average Travel Time	8.4	5.1	8.2	8.9	7.4	9.0	16.1	10.6	17.4
Average Travel Distance	6.8	6.5	6.9	7.2	6.6	7.1	8.1	7.1	7.6
Rocks Road	1810.0	1477.0	1476.0	2117.0	1864.0	2032.0	2417.0	2117.0	2328.0
Waimea Road	2302.0	1954.0	2797.0	2534.0	2326.0	3146.0	2807.0	2814.0	3564.0

	Total Trips Loaded	Average Travel Time	Average Travel Distance	AADT	Weight average travel time	Average daily distance
2018 AM	27882	8.4	6.8			
2018 IP	24939	5.1	6.5			
2018 PM	27823	8.2	6.9	333538	7.3	6.7
2028 AM	31904	8.9	7.2			
2028 IP	29855	7.4	6.6			
2028 PM	33108	9.0	7.1	392541	8.5	7.0
2048 AM	40444	16.1	8.1			
2048 IP	38988	10.6	7.1			
2048 PM	43122	17.4	7.6	507293	14.8	7.6
						7.1

Rock Road + Waimea Road		
Year	AADT	Factor
2018	49091	0.15
2028	58303	0.15
2048	66673	0.13
		0.14

Regression equation	
y	0.00004488x
Intercept	-8.2576457
R ²	0.94



Year	AADT (do-min)	Bike Trips (option)	AADT (Option)	TT (do-min)	TT (option)	TT Benefits	VOC Benefits
2018	333538	0	333538	6.7	6.7	\$ -	\$ -
2019	339438	0	339438	7.0	7.0	\$ -	\$ -
2020	345338	0	345338	7.2	7.2	\$ -	\$ -
Year 0	2021	351239	0	351239	7.5	7.5	\$ -
Year 1	2022	357139	0	357139	7.8	7.8	\$ -
Year 2	2023	363039	0	363039	8.0	8.0	\$ -
Year 3	2024	368940	0	368940	8.3	8.3	\$ -
Year 4	2025	374840	0	374840	8.6	8.6	\$ -
Year 5	2026	380740	0	380740	8.8	8.8	\$ -
Year 6	2027	386641	0	386641	9.1	9.1	\$ -
Year 7	2028	392541	0	392541	9.4	9.4	\$ -
Year 8	2029	398278	479	397799	9.6	9.6	\$ 79,387
Year 9	2030	404016	575	403441	9.9	9.8	\$ 96,649
Year 10	2031	409754	680	409074	10.1	10.1	\$ 115,893
Year 11	2032	415491	796	414695	10.4	10.4	\$ 137,528
Year 12	2033	421229	924	420305	10.6	10.6	\$ 161,802
Year 13	2034	426966	1064	425902	10.9	10.9	\$ 188,799
Year 14	2035	432704	1141	431563	11.2	11.1	\$ 205,153
Year 15	2036	438442	1222	437220	11.4	11.4	\$ 222,597
Year 16	2037	444179	1307	442872	11.7	11.6	\$ 241,158
Year 17	2038	449917	1396	448521	11.9	11.9	\$ 260,865
Year 18	2039	455654	1490	454164	12.2	12.1	\$ 281,934
Year 19	2040	461392	1549	459843	12.4	12.4	\$ 296,763
Year 20	2041	467130	1610	465520	12.7	12.6	\$ 312,257
Year 21	2042	472867	1673	471194	13.0	12.9	\$ 328,431
Year 22	2043	478605	1737	476868	13.2	13.1	\$ 345,101
Year 23	2044	484342	1804	482538	13.5	13.4	\$ 362,674
Year 24	2045	490080	1872	488208	13.7	13.7	\$ 380,767
Year 25	2046	495818	1943	493875	14.0	13.9	\$ 399,796
Year 26	2047	501555	2015	499540	14.3	14.2	\$ 419,367
Year 27	2048	507293	2090	505203	14.5	14.4	\$ 439,907
Year 28	2049					\$ 439,907	\$ 112,851
Year 29	2050					\$ 439,907	\$ 112,851
Year 30	2051					\$ 439,907	\$ 112,851
Year 31	2052					\$ 439,907	\$ 112,851
Year 32	2053					\$ 439,907	\$ 112,851
Year 33	2054					\$ 439,907	\$ 112,851
Year 34	2055					\$ 439,907	\$ 112,851
Year 35	2056					\$ 439,907	\$ 112,851
Year 36	2057					\$ 439,907	\$ 112,851
Year 37	2058					\$ 439,907	\$ 112,851
Year 38	2059					\$ 439,907	\$ 112,851
Year 39	2060					\$ 439,907	\$ 112,851
Year 40	2061					\$ 439,907	\$ 112,851

Demand Assumptions

Bike Type Split		
Type	Split	Benefit
Manual Bike	0.8	2,500
E-Bike	0.2	2,000
Weighted Average	1	2,400

Pedestrian benefits
1250

Typical Growth in Use of Shared Use Paths and NZCT Cycle Trails		
Project	Step change	Ongoing growth
Wainuiomata SUP	+127% in active modes in 12 months	
Northwestern SUP		Cycling - 9% p.a. since 2011 and 17% since 2015
Perth-Freemantle PSP	+94% in cyclists in three months	
Havelock SUP	+300% in 24 months	
Promotion of cycling in Wellington region		Approx 7-8% p.a. growth at Hutt Road SH2 off-ramp since 2009
Typical growth	Approx +100-150% in first year*	

Note: * Assumes path promotion and wider network development

Emissions Assumptions

Valuation of CO2 emissions

Valuing CO₂ emissions appropriately is becoming increasingly important, given the longevity and impact of these emissions in the atmosphere.

The value of **NZD\$65.58 per tonne of CO₂** (as at June 2016) should be used for project evaluation. This is based on the Austroads (2012) value.

The predicted value change in CO₂ emissions shall be calculated as \$65.58 per tonne of CO₂, and must be included in the BCR. CO₂ impacts should also be quantified in tonnes and reported in the project summary sheet.

\$/ton CO ₂	65.58	Monetised Benefits and Cost Manual 2020
CO ₂ emissions / km (g/km)	180	The-NZ-Vehicle-Fleet-2017-Web.pdf
Average cycle trip (km)	4	2018 household travel survey
Average number of cycle day	245	Assuming not all days will be cycled
Average cycle distance per year	980	

Travel Time and Vehicle Operation Assumptions

Table 17: Composite values of travel time (2002)	
Morning commuter peak	\$ 15.13
Daytime inter-peak	\$ 17.95
Afternoon commuter peak	\$ 14.96
Weighted Average daily VOT (2019)	\$ 15.97

Days per year (weekdays)	245
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Passenger car VOC/km @ 50km/h 0 gradient	0.218
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Safety Assumptions

Crash period year	5
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Table A15: Ratio of fatal to serious crash severities		
Movement	Fatal	Serious
All	0.07	0.93

Table A13: Crash trend adjustment factors		
Traffic Growth Rate	1.0%	2.0%
50 and 60 km/h	0.86	0.9

Table A18: Factors for converting reported injury crashes to total injury crash				
	Fatal	Serious	Minor	Non-injury
All	1	1.7	3.6	7

Table A21:A28: Cost per crash by cycle movement				
	Fatal	Serious	Minor	Non-injury
50 km/hr	\$ 4,100,000	\$ 435,000	\$ 24,000	\$ 1,400
100 km/hr	\$ 4,100,000	\$ 465,000	\$ 25,000	\$ 1,700

Discounting Assumptions

Year	Discount Factor	4%
2021	1.0000	
2022	0.9615	
2023	0.9246	
2024	0.8890	
2025	0.8548	
2026	0.8219	
2027	0.7903	
2028	0.7599	
2029	0.7307	
2030	0.7026	
2031	0.6756	
2032	0.6496	
2033	0.6246	
2034	0.6006	
2035	0.5775	
2036	0.5553	
2037	0.5339	
2038	0.5134	
2039	0.4936	
2040	0.4746	
2041	0.4564	
2042	0.4388	
2043	0.4220	
2044	0.4057	
2045	0.3901	
2046	0.3751	
2047	0.3607	
2048	0.3468	
2049	0.3335	
2050	0.3207	
2051	0.3083	
2052	0.2965	
2053	0.2851	
2054	0.2741	
2055	0.2636	
2056	0.2534	

2057	0.2437
2058	0.2343
2059	0.2253
2060	0.2166
2061	0.2083
2062	0.2003
2063	0.1926
2064	0.1852
2065	0.1780
2066	0.1712
2067	0.1646
2068	0.1583
2069	0.1522
2070	0.1463
2071	0.1407
2072	0.1353
2073	0.1301
2074	0.1251
2075	0.1203
2076	0.1157
2077	0.1112
2078	0.1069
2079	0.1028
2080	0.0989
2081	0.0951

Construction Cost

Construction starts in year 1 and finish in year 6

Cost assumed to be spread between 5 years of construction

	95%ile	Expected	Low	
\$	163,641,820	\$	130,386,570	
Do Min	\$	98,185,092.0	\$	78,231,942.0
Wall Replacement 2050			\$	-
				Assume 60% Option to rebuild the wall in 2050

3 Cycleway C001 Economics

Year	Health		Safety		Emissions				
	Undisc	Disc	Undisc	Disc	veh/year less	tons CO2	Undisc	Disc	
2018	\$ -	\$ -	\$ -	\$ -		0	0 \$	- \$	-
2019	\$ -	\$ -	\$ -	\$ -		0	0 \$	- \$	-
2020	\$ -	\$ -	\$ -	\$ -		0	0 \$	- \$	-
Year 0	2021	\$ -	\$ -	\$ -		0	0 \$	- \$	-
Year 1	2022	\$ -	\$ -	\$ -		0	0 \$	- \$	-
Year 2	2023	\$ 807,600	\$ 746,672	\$ -		337	59 \$	3,899 \$	3,604
Year 3	2024	\$ 819,360	\$ 728,408	\$ -		341	60 \$	3,945 \$	3,507
Year 4	2025	\$ 831,120	\$ 710,445	\$ -		346	61 \$	4,003 \$	3,421
Year 5	2026	\$ 842,880	\$ 692,786	\$ -		351	62 \$	4,060 \$	3,337
Year 6	2027	\$ 854,640	\$ 675,434	\$ -		356	63 \$	4,118 \$	3,255
Year 7	2028	\$ 866,400	\$ 658,393	\$ -		361	64 \$	4,176 \$	3,174
Year 8	2029	\$ 878,160	\$ 641,663	\$ -		366	65 \$	4,234 \$	3,094
Year 9	2030	\$ 889,920	\$ 625,246	\$ -		371	65 \$	4,292 \$	3,015
Year 10	2031	\$ 901,680	\$ 609,143	\$ -		376	66 \$	4,350 \$	2,938
Year 11	2032	\$ 913,440	\$ 593,353	\$ -		381	67 \$	4,408 \$	2,863
Year 12	2033	\$ 925,200	\$ 577,877	\$ -		386	68 \$	4,465 \$	2,789
Year 13	2034	\$ 936,960	\$ 562,714	\$ -		390	69 \$	4,512 \$	2,710
Year 14	2035	\$ 948,720	\$ 547,862	\$ -		395	70 \$	4,569 \$	2,639
Year 15	2036	\$ 960,480	\$ 533,320	\$ -		400	71 \$	4,627 \$	2,569
Year 16	2037	\$ 972,240	\$ 519,087	\$ -		405	71 \$	4,685 \$	2,501
Year 17	2038	\$ 984,000	\$ 505,159	\$ -		410	72 \$	4,743 \$	2,435
Year 18	2039	\$ 995,760	\$ 491,535	\$ -		415	73 \$	4,801 \$	2,370
Year 19	2040	\$ 1,007,520	\$ 478,212	\$ -		420	74 \$	4,859 \$	2,306
Year 20	2041	\$ 1,019,280	\$ 465,186	\$ -		425	75 \$	4,917 \$	2,244
Year 21	2042	\$ 1,031,040	\$ 452,455	\$ -		430	76 \$	4,974 \$	2,183
Year 22	2043	\$ 1,042,800	\$ 440,015	\$ -		435	77 \$	5,032 \$	2,123
Year 23	2044	\$ 1,054,560	\$ 427,863	\$ -		439	77 \$	5,078 \$	2,060
Year 24	2045	\$ 1,066,320	\$ 415,994	\$ -		444	78 \$	5,136 \$	2,004
Year 25	2046	\$ 1,078,080	\$ 404,406	\$ -		449	79 \$	5,194 \$	1,948
Year 26	2047	\$ 1,089,840	\$ 393,094	\$ -		454	80 \$	5,252 \$	1,894
Year 27	2048	\$ 1,101,600	\$ 382,053	\$ -		459	81 \$	5,310 \$	1,842
Year 28	2049	\$ 1,101,600	\$ 367,359	\$ -		459	81 \$	5,310 \$	1,771
Year 29	2050	\$ 1,101,600	\$ 353,230	\$ -		459	81 \$	5,310 \$	1,703
Year 30	2051	\$ 1,101,600	\$ 339,644	\$ -		459	81 \$	5,310 \$	1,637
Year 31	2052	\$ 1,101,600	\$ 326,581	\$ -		459	81 \$	5,310 \$	1,574
Year 32	2053	\$ 1,101,600	\$ 314,020	\$ -		459	81 \$	5,310 \$	1,514
Year 33	2054	\$ 1,101,600	\$ 301,942	\$ -		459	81 \$	5,310 \$	1,455
Year 34	2055	\$ 1,101,600	\$ 290,329	\$ -		459	81 \$	5,310 \$	1,399
Year 35	2056	\$ 1,101,600	\$ 279,162	\$ -		459	81 \$	5,310 \$	1,346
Year 36	2057	\$ 1,101,600	\$ 268,425	\$ -		459	81 \$	5,310 \$	1,294
Year 37	2058	\$ 1,101,600	\$ 258,101	\$ -		459	81 \$	5,310 \$	1,244
Year 38	2059	\$ 1,101,600	\$ 248,174	\$ -		459	81 \$	5,310 \$	1,196
Year 39	2060	\$ 1,101,600	\$ 238,629	\$ -		459	81 \$	5,310 \$	1,150
Year 40	2061	\$ 1,101,600	\$ 229,451	\$ -		459	81 \$	5,310 \$	1,106
Total	\$ 39,140,400	\$ 18,093,423	\$ -	\$ -		16309	2877 \$	188,668 \$	87,216

Undisc Total	\$ 39,477,474
Disc Total	\$ 18,246,882
Cost	\$ 11,298,077
BCR	1.6

SA Code	SA2 Region	Resident Population				2018 Census, main means of travel to education, by usual residence address, for the census usually resident population count attending, studying, or enrolled in education													Work at home
		2006 Census	2013 Census	2018 Census	Population growth %	Study at home	Drive a car, truck or van	Passenger in a car, truck or van	Bicycle	Walk or jog	School bus	Public bus	Train	Ferry	Other	Total stated	Not elsewhere included	Total	
303600	Nelson Rural	1536	1704	1896	2%	30	54	162	3	12	156	6	0	0	3	429	0	429	237
303700	Inlets Nelson City	3	3	57	59%	0	0	0	0	0	0	0	0	0	0	6	0	6	3
303800	Marybank	906	1011	1068	1%	6	27	63	6	33	63	6	0	0	0	207	0	207	90
303900	Port Nelson	99	81	33	-18%	0	0	0	0	0	0	0	0	0	0	0	0	0	3
304000	Nelson Airport	96	105	96	-2%	0	0	6	0	0	0	0	0	0	0	18	0	18	3
304100	Tahunanui	2493	2589	2745	1%	45	84	162	69	132	15	21	0	0	12	540	0	540	174
304200	Britannia	1566	1650	1767	1%	27	54	141	30	75	12	3	0	0	6	348	0	348	144
304300	Atawhai	2208	2556	2790	2%	54	63	234	51	12	159	9	0	0	6	594	0	594	177
304400	Broadgreen-Monaco	2298	2298	2376	1%	36	63	123	72	225	0	9	0	0	15	546	0	546	129
304500	Washington	2526	2469	2847	3%	45	93	303	60	183	39	12	0	0	9	744	0	744	180
304600	Tahuna Hills	2430	2652	2847	1%	42	81	267	66	63	18	21	0	0	9	570	0	570	210
304700	Nelson Central-Trafalgar	483	579	675	3%	6	15	18	12	96	12	6	0	0	0	165	0	165	69
304800	The Wood	2790	2835	2907	1%	24	48	156	96	165	33	6	3	0	12	537	0	537	171
304900	Toi Toi	1548	1548	1659	1%	30	45	159	45	141	18	6	0	3	15	459	0	459	72
305000	Nayland	1632	1725	1899	2%	21	51	126	66	141	6	15	0	0	9	435	0	435	105
305100	Aldinga	2448	2580	3168	4%	39	51	228	93	117	9	18	0	0	6	564	0	564	138
305200	Victory	1560	1512	1611	1%	27	42	90	45	216	9	9	0	0	9	441	0	441	63
305300	Rutherford	2475	2490	2583	1%	36	51	96	42	459	18	6	0	0	15	723	0	723	231
305400	Maitlands	1932	2022	2148	1%	42	63	189	63	90	0	15	0	0	12	474	0	474	129
305500	Maitai	1332	1314	1362	1%	33	39	69	72	117	24	0	0	0	3	357	0	357	99
305600	Grampians	1941	2235	2412	2%	36	54	234	48	159	18	6	0	0	3	561	0	561	108
305700	Saxton	54	60	57	-1%	0	0	0	0	0	0	0	0	0	0	9	0	9	6
305800	Suffolk	1803	2625	2721	1%	27	60	234	60	45	18	9	0	0	18	468	0	468	126
305900	Omaio	2310	2718	3387	4%	36	60	294	78	156	12	21	0	0	27	690	0	690	159
306000	Enner Glynn	2706	2760	2916	1%	51	102	264	87	141	12	21	0	0	15	693	0	693	231
306100	Daelyn	102	462	852	12%	24	21	96	21	72	3	6	0	0	6	249	0	249	57
306200	The Brook	1605	1857	1992	1%	36	48	177	78	114	42	15	0	0	18	528	0	528	96
363500	Oceanic Nelson Region	0	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		42882	46440	50871	2%	753	1269	3891	1263	2964	696	246	3	3	228	11355	0	11355	3210

2018 Census, main means of travel to work, by usual residence address, for the employed census usually resident population count aged 15 years and over													2018 JTW + JTE				Area			
Did not go to work today	Drive a private car, truck or van	Drive a company car, truck or van	Passenger in a car, truck, van or company bus	Public bus	Train	Bicycle	Walk or jog	Ferry	Other	Total stated	Not elsewhere included	Total	Vehicle	Bicycle	Total	Bicycle %	Total Area (km ²)	Buffer 400m (km ²)	Buffer 800m (km ²)	Buffer 1600m (km ²)
0	606	159	45	3	0	33	15	0	24	1119	0	1119	1026	36	1548	2%	367.32	0.00	0.00	0.00
0	15	3	0	0	0	3	6	0	0	30	0	30	18	3	36	8%	25.08	0.00	0.00	0.00
0	315	69	24	6	3	24	9	0	12	552	0	552	498	30	759	4%	1.01	0.00	0.00	0.00
0	12	0	3	0	0	3	3	0	0	27	0	27	15	3	27	11%	0.98	0.00	0.00	0.00
0	33	3	3	0	0	9	6	0	0	57	0	57	45	9	75	12%	2.96	0.00	0.00	0.00
0	867	123	45	18	0	105	96	0	24	1455	0	1455	1281	174	1995	9%	1.62	0.00	0.00	0.00
0	489	102	30	0	3	66	99	0	12	945	0	945	816	96	1293	7%	0.84	0.00	0.00	0.00
0	909	183	51	9	0	105	27	0	27	1485	0	1485	1440	156	2079	8%	4.54	0.00	0.00	0.00
0	723	156	36	15	0	72	51	0	30	1209	0	1209	1101	144	1755	8%	1.14	0.00	0.00	0.00
0	924	141	90	12	3	75	132	0	30	1587	0	1587	1551	135	2331	6%	1.13	0.00	0.01	0.09
0	945	204	54	12	0	99	69	0	27	1626	0	1626	1551	165	2196	8%	2.68	0.01	0.17	0.80
0	132	18	9	3	3	12	135	0	9	387	0	387	192	24	552	4%	1.25	0.00	0.04	0.02
0	636	120	24	12	0	117	249	0	18	1341	0	1341	984	213	1878	11%	1.16	0.00	0.00	0.00
0	519	78	39	6	0	63	54	0	27	855	0	855	840	108	1314	8%	1.31	0.13	0.37	0.63
0	642	105	42	21	0	69	60	0	12	1050	0	1050	966	135	1485	9%	0.84	0.00	0.00	0.00
0	885	186	30	15	0	51	51	0	27	1383	0	1383	1380	144	1947	7%	1.11	0.00	0.00	0.00
0	441	75	24	9	0	63	84	0	12	771	0	771	672	108	1212	9%	0.63	0.51	0.12	0.00
0	588	93	39	6	0	108	351	0	36	1449	0	1449	867	150	2172	7%	1.22	0.13	0.34	0.34
0	726	138	33	6	0	69	45	0	24	1176	0	1176	1149	132	1650	8%	0.77	0.00	0.00	0.00
0	336	57	15	3	0	105	120	0	15	744	0	744	516	177	1101	16%	0.93	0.00	0.00	0.00
0	714	129	60	18	0	69	99	3	30	1230	0	1230	1191	117	1791	7%	2.96	0.33	0.56	1.24
0	18	6	3	0	0	6	6	0	0	42	0	42	27	6	51	12%	3.87	0.00	0.00	0.00
0	771	165	39	15	3	42	48	0	15	1224	0	1224	1269	102	1692	6%	2.01	0.00	0.00	0.00
0	1008	186	51	18	0	60	57	0	33	1572	0	1572	1599	138	2262	6%	5.48	0.00	0.00	0.00
0	1020	207	51	9	0	78	30	0	33	1665	0	1665	1644	165	2358	7%	7.07	0.00	0.00	0.09
0	219	66	15	3	0	9	6	0	3	384	0	384	417	30	633	5%	1.48	0.00	0.00	0.00
0	603	108	33	12	3	108	84	0	27	1068	0	1068	969	186	1596	12%	6.92	0.00	0.00	0.54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	789.91	0.00	0.00	0.00
0	15096	2880	888	231	18	1623	1992	3	507	26433	0	26433	24024	2886	37788	8%	1238.25	1.11	1.61	3.77

2018 Population			2018 Existing daily cyclists			2018 Population * Likelihood			2018 new cyclist rate	2018 total existing daily cyclists	2018 total new daily cyclists	2048 Population			2048 Existing daily cyclists			2048 Population * Likelihood		
Buffer 400m	Buffer 800m	Buffer 1600m	Buffer 400m	Buffer 800m	Buffer 1600m	Buffer 400m	Buffer 800m	Buffer 1600m				Buffer 400m	Buffer 800m	Buffer 1600m	Buffer 400m	Buffer 800m	Buffer 1600m	Buffer 400m	Buffer 800m	Buffer 1600m
0	0	0	0	0	0	0	0	0	3%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	8%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	4%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	11%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	12%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	9%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	7%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	8%	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	8%	0	0	0	0	0	0	0	0	0	0	
0	19	225	0	1	13	0	10	47	6%	14	3	0	45	529	0	3	31	0	24	111
8	180	852	1	14	64	8	97	179	8%	78	21	12	276	1304	1	21	98	12	149	274
0	21	12	0	1	1	0	11	3	4%	1	1	0	53	30	0	2	1	0	29	6
0	0	0	0	0	0	0	0	0	11%	0	0	0	0	0	0	0	0	0	0	0
169	469	796	14	39	65	176	253	167	8%	118	49	256	711	1206	21	58	99	266	384	253
0	0	0	0	0	0	0	0	0	9%	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	7%	0	0	0	0	0	0	0	0	0	0	0
1300	311	0	116	28	0	1352	168	0	9%	144	135	1902	455	0	169	41	0	1978	246	0
277	728	729	19	50	50	288	393	153	7%	120	58	345	907	908	24	63	63	359	490	191
0	0	0	0	0	0	0	0	0	8%	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	16%	0	0	0	0	0	0	0	0	0	0	0
265	457	1014	17	30	66	276	247	213	7%	113	49	419	722	1602	27	47	105	436	390	336
0	0	0	0	0	0	0	0	0	12%	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	6%	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	6%	0	0	0	0	0	0	0	0	0	0	0
0	0	38	0	0	3	0	0	8	7%	3	1	0	0	53	0	0	4	0	0	11
0	0	0	0	0	0	0	0	0	5%	0	0	0	0	0	0	0	0	0	0	0
0	0	157	0	0	18	0	0	33	12%	18	4	0	0	239	0	0	28	0	0	50
0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0	0	0	0	0	0
2019	2185	3823	167	163	280	2100	1179	803	8%	614	312	2934	3169	5871	242	235	429	3051	1712	1232

2048 new cyclist rate	2048 total existing daily cyclists	2048 total new daily cyclists
3%	0	0
8%	0	0
4%	0	0
11%	0	0
12%	0	0
9%	0	0
7%	0	0
8%	0	0
8%	0	0
6%	33	8
8%	120	33
4%	4	2
11%	0	0
8%	179	74
9%	0	0
7%	0	0
9%	210	197
7%	149	72
8%	0	0
16%	0	0
7%	179	77
12%	0	0
6%	0	0
6%	0	0
7%	4	1
5%	0	0
12%	28	6
0%	0	0
8%	916	459

SP11 Worksheet 7 - 2018 Cycle demand			
Buffers (km)	Less than 400m	400m - 800m	800m - 1600m
1 Area (km ²)	1.1	1.6	3.8
2 Density	Different for every SA2 zone		
3 Population in each buffer (3) = (1) x (2)	2019	2185	3823
4 Total population in all buffers (Sum of (3))	8027		
5 Commute share	Different for every SA2 zone		
6 Likelihood of new cyclist multiplier	1.04	0.54	0.21
7 Row (7) = (3) x (6)	2100	1179	803
8 Sum of row (7)	4082		
9 Cyclist rate (9) = ((5) x 0.96) + 0.32%	Different for every SA2 zone		
10 Total existing daily cyclists (10) = (4) x (9)	614		
11 Total new daily cyclists (11) = (8) x (9)	312		

SP11 Worksheet 7 - 2048 Cycle demand			
Buffers (km)	Less than 400m	400m - 800m	800m - 1600m
1 Area (km ²)	1.1	1.6	3.8
2 Density	Different for every SA2 zone		
3 Population in each buffer (3) = (1) x (2)	2934	3169	5871
4 Total population in all buffers (Sum of (3))	11974		
5 Commute share	Different for every SA2 zone		
6 Likelihood of new cyclist multiplier	1.04	0.54	0.21
7 Row (7) = (3) x (6)	3051	1712	1232
8 Sum of row (7)	5995		
9 Cyclist rate (9) = ((5) x 0.96) + 0.32%	Different for every SA2 zone		
10 Total existing daily cyclists (10) = (4) x (9)	916		
11 Total new daily cyclists (11) = (8) x (9)	459		

Year	2018
Year	2019
Year	2020
Year 0	2021
Year 1	2022
Year 2	2023
Year 3	2024
Year 4	2025
Year 5	2026
Year 6	2027
Year 7	2028
Year 8	2029
Year 9	2030
Year 10	2031
Year 11	2032
Year 12	2033
Year 13	2034
Year 14	2035
Year 15	2036
Year 16	2037
Year 17	2038
Year 18	2039
Year 19	2040
Year 20	2041
Year 21	2042
Year 22	2043
Year 23	2044
Year 24	2045
Year 25	2046
Year 26	2047
Year 27	2048
Year 28	2049
Year 29	2050
Year 30	2051
Year 31	2052
Year 32	2053
Year 33	2054
Year 34	2055
Year 35	2056
Year 36	2057
Year 37	2058
Year 38	2059
Year 39	2060
Year 40	2061

Do-minimum 2020		Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
3	Number of years of typical crash rate records	5			
4	Number of reported crashes over period	0	1	3	1
5	Fatal/serious severity ratio	0.1	0.9	1	1
6	Number of reported crashes adjusted by severity (4) x (5)	0.1	1	3	1
7	Crashes per year = (6) / (3)	0.0	0.2	1	0.1
8	Adjustment factor for crash trend	0.90			
9	Adjusted crashes per year = (7) x (8)	0.0	0.2	0.5	0.1
10	Under-reporting factors	1	1.7	3.6	7
11	Total estimated crashes per year = (9) x (10)	0.0	0.3	1.6	0.6
12	Crash cost, 100km/h limit	\$4,100,000	\$465,000	\$25,000	\$1,700
13	Crash cost, 50km/h limit	\$4,100,000	\$435,000	\$24,000	\$1,400
14	Mean speed adjustment = ((1) - 50)/50	0			
15	Cost per crash = (13) + (14) x [(12) - (13)]	\$4,100,000	\$435,000	\$24,000	\$1,400
16	Crash cost per year = (11) x (15)	\$51,660	\$123,792	\$38,880	\$882
17	Total cost of crashes per year (sum of columns in row (16) fatal + serious + minor + non-injury)	\$215,214			

Option 2020		Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
18	Percentage crash reduction	0%	0%	0%	0%
19	Percentage of crashes 'remaining' [100 - (18)]	100%	100%	100%	100%
20	Predicted crashes per year (11) x (19)	0.0	0.3	1.6	0.6
21	Crash cost, 100km/h limit	\$4,100,000	\$465,000	\$25,000	\$1,700
22	Crash cost, 50km/h limit	\$4,100,000	\$435,000	\$24,000	\$1,400
23	Mean speed adjustment = ((2) - 50)/50	0			
24	Cost per crash = (22) + (23) x [(21) - (22)]	\$4,100,000	\$435,000	\$24,000	\$1,400
25	Crash cost per year = (20) x (24)	\$51,660	\$123,792	\$38,880	\$882
26	Total cost of crashes per year (sum of columns in row (25) fatal + serious + minor + non-injury)	\$215,214			
27	Annual crash cost savings = (17) - (26)	\$0			

Do-minimum 2048		Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
3	Number of years of typical crash rate records	5			
4	Number of reported crashes over period	0	1	3	1
5	Fatal/serious severity ratio	0.1	0.9	1	1
6	Number of reported crashes adjusted by severity (4) x (5)	0.1	0.9	3	1
7	Crashes per year = (6) / (3)	0.0	0.2	0.6	0.2
8	Adjustment factor for crash trend	0.90			
9	Adjusted crashes per year = (7) x (8)	0.0	0.2	0.5	0.2
10	Under-reporting factors	1	1.7	3.6	7
11	Total estimated crashes per year = (9) x (10)	0.0	0.5	2.7	1.0
12	Crash cost, 100km/h limit	\$4,100,000	\$465,000	\$25,000	\$1,700
13	Crash cost, 50km/h limit	\$4,100,000	\$435,000	\$24,000	\$1,400
14	Mean speed adjustment = ((1) - 50)/50	0			
15	Cost per crash = (13) + (14) x [(12) - (13)]	\$4,100,000	\$435,000	\$24,000	\$1,400
16	Crash cost per year = (11) x (15)	\$86,058	\$206,220	\$64,768	\$1,469
17	Total cost of crashes per year (sum of columns in row (16) fatal + serious + minor + non-injury)	\$358,516			

Option 2048		Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
18	Percentage crash reduction	0%	0%	0%	0%
19	Percentage of crashes 'remaining' [100 - (18)]	100%	100%	100%	100%
20	Predicted crashes per year (11) x (19)	0.0	0.5	2.7	1.0
21	Crash cost, 100km/h limit	\$4,100,000	\$465,000	\$25,000	\$1,700
22	Crash cost, 50km/h limit	\$4,100,000	\$435,000	\$24,000	\$1,400
23	Mean speed adjustment = ((2) - 50)/50	0			
24	Cost per crash = (22) + (23) x [(21) - (22)]	\$4,100,000	\$435,000	\$24,000	\$1,400
25	Crash cost per year = (20) x (24)	\$86,058	\$206,220	\$64,768	\$1,469
26	Total cost of crashes per year (sum of columns in row (25) fatal + serious + minor + non-injury)	\$358,516			
27	Annual crash cost savings = (17) - (26)	\$0			

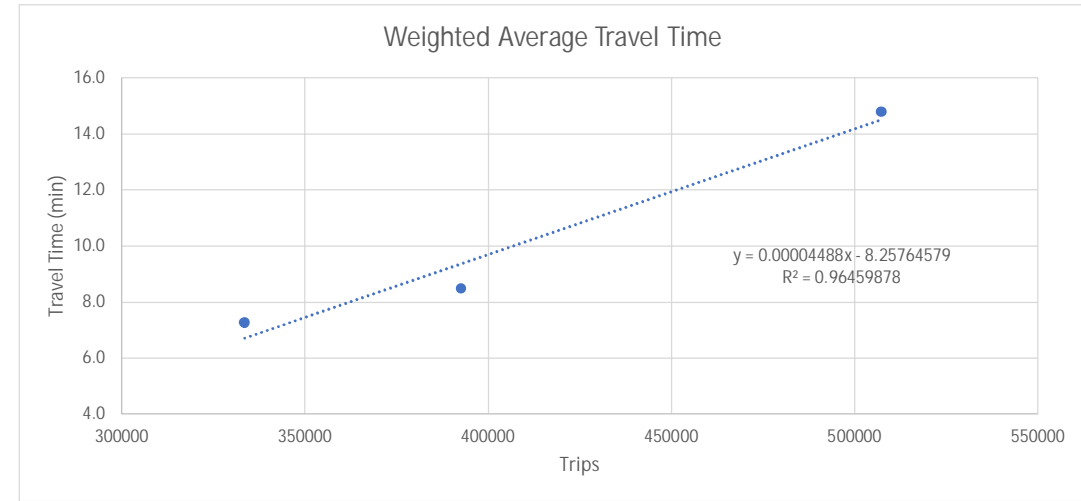
Year 0
Year 1
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Year 39
Year 40

Year	Linear		Final	
2018	\$	-	\$	-
2019	\$	-	\$	-
2020	\$	-	\$	-
2021	\$	-	\$	-
2022	\$	-	\$	-
2023	\$	-	\$	-
2024	\$	-	\$	-
2025	\$	-	\$	-
2026	\$	-	\$	-
2027	\$	-	\$	-
2028	\$	-	\$	-
2029	\$	-	\$	-
2030	\$	-	\$	-
2031	\$	-	\$	-
2032	\$	-	\$	-
2033	\$	-	\$	-
2034	\$	-	\$	-
2035	\$	-	\$	-
2036	\$	-	\$	-
2037	\$	-	\$	-
2038	\$	-	\$	-
2039	\$	-	\$	-
2040	\$	-	\$	-
2041	\$	-	\$	-
2042	\$	-	\$	-
2043	\$	-	\$	-
2044	\$	-	\$	-
2045	\$	-	\$	-
2046	\$	-	\$	-
2047	\$	-	\$	-
2048	\$	-	\$	-
2049	\$	-	\$	-
2050	\$	-	\$	-
2051	\$	-	\$	-
2052	\$	-	\$	-
2053	\$	-	\$	-
2054	\$	-	\$	-
2055	\$	-	\$	-
2056	\$	-	\$	-
2057	\$	-	\$	-
2058	\$	-	\$	-
2059	\$	-	\$	-
2060	\$	-	\$	-
2061	\$	-	\$	-

	2018 AM	2018 IP	2018 PM	2028 AM	2028 IP	2028 PM	2048 AM	2048 IP	2048 PM
Total Travel Time	3882	2109	3798	4756	3706	4974	10823	6910	12506
Total Trips Loaded	27882	24939	27823	31904	29855	33108	40444	38988	43122
Total Travel Distance	189304	160879	191577	228530	196575	234854	328432	276492	329766
Average Travel Time	8.4	5.1	8.2	8.9	7.4	9.0	16.1	10.6	17.4
Average Travel Distance	6.8	6.5	6.9	7.2	6.6	7.1	8.1	7.1	7.6

	Total Trips Loaded	Average Travel Time	Average Travel Distance	AAADT	Weight average travel time	Average daily distance
2018 AM	27882	8.4	6.8			
2018 IP	24939	5.1	6.5			
2018 PM	27823	8.2	6.9	333538	7.3	6.7
2028 AM	31904	8.9	7.2			
2028 IP	29855	7.4	6.6			
2028 PM	33108	9.0	7.1	392541	8.5	7.0
2048 AM	40444	16.1	8.1			
2048 IP	38988	10.6	7.1			
2048 PM	43122	17.4	7.6	507293	14.8	7.6
						7.1

Regression equation	
y	0.00004488x
Intercept	-8.2576457
R ²	0.94

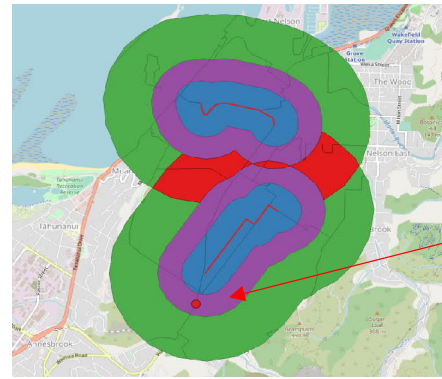
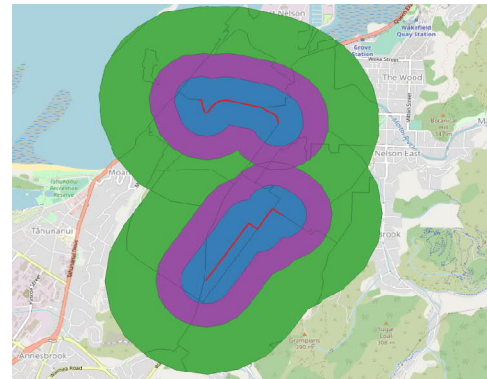
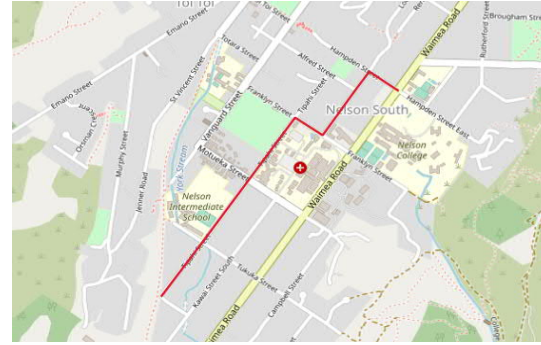


Year	AAADT (do-min)	Bike Trips (option)	AAADT (Option)	TT (do-min)	TT (option)	TT Benefits	VOC Benefits
2018	333538	0	333538	6.7	6.7	\$ -	\$ -
2019	339438	0	339438	7.0	7.0	\$ -	\$ -
2020	345338	0	345338	7.2	7.2	\$ -	\$ -
Year 0	351239	0	351239	7.5	7.5	\$ -	\$ -
Year 1	357139	0	357139	7.8	7.8	\$ -	\$ -
Year 2	363039	337	362702	8.0	8.0	\$ 1,874	\$ 670
Year 3	368940	341	368599	8.3	8.3	\$ 1,927	\$ 678
Year 4	374840	346	374494	8.6	8.5	\$ 1,987	\$ 688
Year 5	380740	351	380389	8.8	8.8	\$ 2,047	\$ 698
Year 6	386641	356	386285	9.1	9.1	\$ 2,109	\$ 707
Year 7	392541	361	392180	9.4	9.3	\$ 2,171	\$ 717
Year 8	398278	366	397912	9.6	9.6	\$ 2,233	\$ 727
Year 9	404016	371	403645	9.9	9.9	\$ 2,296	\$ 737
Year 10	409754	376	409378	10.1	10.1	\$ 2,360	\$ 747
Year 11	415491	381	415110	10.4	10.4	\$ 2,425	\$ 757
Year 12	421229	386	420843	10.6	10.6	\$ 2,491	\$ 767
Year 13	426966	390	426576	10.9	10.9	\$ 2,551	\$ 775
Year 14	432704	395	432309	11.2	11.1	\$ 2,618	\$ 785
Year 15	438442	400	438042	11.4	11.4	\$ 2,687	\$ 795
Year 16	444179	405	443774	11.7	11.7	\$ 2,756	\$ 805
Year 17	449917	410	449507	11.9	11.9	\$ 2,826	\$ 815
Year 18	455654	415	455239	12.2	12.2	\$ 2,897	\$ 825
Year 19	461392	420	460972	12.4	12.4	\$ 2,969	\$ 835
Year 20	467130	425	466705	12.7	12.7	\$ 3,041	\$ 845
Year 21	472867	430	472437	13.0	12.9	\$ 3,115	\$ 854
Year 22	478605	435	478170	13.2	13.2	\$ 3,189	\$ 864
Year 23	484342	439	483903	13.5	13.5	\$ 3,257	\$ 872
Year 24	490080	444	489636	13.7	13.7	\$ 3,333	\$ 882
Year 25	495818	449	495369	14.0	14.0	\$ 3,410	\$ 892
Year 26	501555	454	501101	14.3	14.2	\$ 3,488	\$ 902
Year 27	507293	459	506834	14.5	14.5	\$ 3,567	\$ 912
Year 28						\$ 3,567	\$ 912
Year 29						\$ 3,567	\$ 912
Year 30						\$ 3,567	\$ 912
Year 31						\$ 3,567	\$ 912
Year 32						\$ 3,567	\$ 912
Year 33						\$ 3,567	\$ 912
Year 34						\$ 3,567	\$ 912
Year 35						\$ 3,567	\$ 912
Year 36						\$ 3,567	\$ 912
Year 37						\$ 3,567	\$ 912
Year 38						\$ 3,567	\$ 912
Year 39						\$ 3,567	\$ 912
Year 40						\$ 3,567	\$ 912

Demand Assumptions

Bike Type Split		
Type	Split	Benefit
Manual Bike	0.8	2,500
E-Bike	0.2	2,000
Weighted Average	1	2,400

Demand Calibration	
2018 Railway Reserve - Bishopdale	629
2018 C001 Buffer Zone Bike Trips	610
Factor	1.00



Blue - 400 m buffer
 Purple - 800 m buffer
 Green - 1600 m buffer
 Red - Buffer overlap

Cycle counter Location
 New cyclist generated from this proposed cycle route are likely to exist or/and enter from this location

Emissions Assumptions

Valuation of CO₂ emissions

Valuing CO₂ emissions appropriately is becoming increasingly important, given the longevity and impact of these emissions in the atmosphere.

The value of **NZD\$65.58 per tonne of CO₂** (as at June 2016) should be used for project evaluation. This is based on the Austroads (2012) value.

The predicted value change in CO₂ emissions shall be calculated as \$65.58 per tonne of CO₂, and must be included in the BCR. CO₂ impacts should also be quantified in tonnes and reported in the project summary sheet.

\$/ton CO ₂	65.58	Monetised Benefits and Cost Manual 2020
CO ₂ emissions / km (g/km)	180	The-NZ-Vehicle-Fleet-2017-Web.pdf
Average cycle trip (km)	4	2018 household travel survey
Average number of cycle day	245	Assuming not all days will be cycled
Average cycle distance per year	980	

Travel Time and Vehicle Operation Assumptions

Table 17: Composite values of travel time (2002)	
Morning commuter peak	\$ 15.13
Daytime inter-peak	\$ 17.95
Afternoon commuter peak	\$ 14.96
Weighted Average daily VOT (2019)	\$ 15.97

Days per year (weekdays)
245

Passenger car VOC/km @ 50km/h 0 gradient
0.218

Safety Assumptions

Crash period year	
Year	5

Table A15: Ratio of fatal to serious		
Movement	Fatal	Serious
All	0.07	0.93

Table A13: Crash trend adjustment factors		
Traffic Growth Rate	1.0%	2.0%
50 and 60 km/h	0.86	0.9

Table A18: Factors for converting reported injury crashes to				
	Fatal	Serious	Minor	Non-injury
All	1	1.7	3.6	7

Table A21:A28: Cost per crash by cycle movement				
	Fatal	Serious	Minor	Non-injury
50 km/hr	\$ 4,100,000	\$ 435,000	\$ 24,000	\$ 1,400
100 km/hr	\$ 4,100,000	\$ 465,000	\$ 25,000	\$ 1,700

CEC Common Cyclist Crash Reduction	
Advanced cycle stop boxes	35%

Discounting Assumptions

Year	Discount Factor	4%
2021	1.0000	
2022	0.9615	
2023	0.9246	
2024	0.8890	
2025	0.8548	
2026	0.8219	
2027	0.7903	
2028	0.7599	
2029	0.7307	
2030	0.7026	
2031	0.6756	
2032	0.6496	
2033	0.6246	
2034	0.6006	
2035	0.5775	
2036	0.5553	
2037	0.5339	

2038	0.5134
2039	0.4936
2040	0.4746
2041	0.4564
2042	0.4388
2043	0.4220
2044	0.4057
2045	0.3901
2046	0.3751
2047	0.3607
2048	0.3468
2049	0.3335
2050	0.3207
2051	0.3083
2052	0.2965
2053	0.2851
2054	0.2741
2055	0.2636
2056	0.2534
2057	0.2437
2058	0.2343
2059	0.2253
2060	0.2166
2061	0.2083

Construction Cost

Construction completed in year 1 and therefore, the benefits start at year 2

	High	Low
Year 0	\$ 11,750,000	\$ 8,200,000
Year 1	\$ 11,298,077	\$ 7,884,615

ID	SA22018_V1	SA22018__1	Area
WC071	304500	Washington	420732
WC071	303700	Inlets Nelson City	7144
C001	304600	Tahuna Hills	7944
WC071	304700	Nelson Central-Trafalgar	184587
WC071	304200	Britannia	364372
C001	304900	Toi Toi	133558
C001	305200	Victory	509718
C001	305600	Grampians	325013
C001	305300	Rutherford	130629
			2083697

	363500	306000	305900	305800	303800	303700	303600	306200	306100	305300	304200	304100	304700	304600	304400	305600
Route	Oceanic Ne	Enner Glyn	Omaio	Suffolk	Marybank	Inlets Nelsc	Nelson Rur	The Brook	Daelyn	Rutherford	Britannia	Tahunanui	Nelson Cer	Tahuna Hill	Broadgreer	Grampians
C001	0	0	0	0	0	0	0	0	0	130629	0	0	0	7944	0	325013
WC071	0	0	0	0	0	7144	0	0	0	0	364372	0	184587	0	0	0

	Route	C001	WC071
363500	Oceanic Ne	0	0
306000	Enner Glyn	0	0
305900	Omaio	0	0
305800	Suffolk	0	0
303800	Marybank	0	0
303700	Inlets Nelsc	0	7144
303600	Nelson Rur	0	0
306200	The Brook	0	0
306100	Daelyn	0	0
305300	Rutherford	130629	0
304200	Britannia	0	364372
304100	Tahunanui	0	0
304700	Nelson Cer	0	184587
304600	Tahuna Hill	7944	0
304400	Broadgreer	0	0
305600	Grampians	325013	0
304300	Atawhai	0	0
304000	Nelson Airp	0	0
304500	Washington	0	420732
303900	Port Nelson	0	0
305700	Saxton	0	0
305500	Maitai	0	0
305400	Maitlands	0	0
305200	Victory	509718	0
305100	Aldinga	0	0
305000	Nayland	0	0
304900	Toi Toi	133558	0
304800	The Wood	0	0

304300	304000	304500	303900	305700	305500	305400	305200	305100	305000	304900	304800	
Atawhai	Nelson Air	Washington	Port Nelson	Saxton	Maitai	Maitlands	Victory	Aldinga	Nayland	Toi Toi	The Wood	Total
0	0	0	0	0	0	0	509718	0	0	133558	0	1106862
0	0	420732	0	0	0	0	0	0	0	0	0	976835
											Total	2083697
											Check	TRUE

ID	SA22018_V1	SA22018__1	Area
WC071	303700	Inlets Nelson City	241280
WC071	304700	Nelson Central-Trafalgar	337605
WC071	305300	Rutherford	107225
C001	304600	Tahuna Hills	169861
C001	304700	Nelson Central-Trafalgar	36164
WC071	303900	Port Nelson	31487
C001	304500	Washington	7450
C001	304900	Toi Toi	370360
C001	305200	Victory	121910
C001	305600	Grampians	561222
C001	305300	Rutherford	331801
C001	305300	Rutherford	11422
WC071	305300	Rutherford	11422
WC071	304500	Washington	448391
C001	304700	Nelson Central-Trafalgar	3567
WC071	304700	Nelson Central-Trafalgar	3567
WC071	304200	Britannia	307667
			3102401

	363500	306000	305900	305800	303800	303700	303600	306200	306100	305300	304200	304100	304700	304600	304400
Route	Oceanic N	Enner Glyn	Omaio	Suffolk	Marybank	Inlets Nelson	Nelson Ru	The Brook	Daelyn	Rutherford	Britannia	Tahunanui	Nelson Ce	Tahuna Hill	Broadgreen
C001	0	0	0	0	0	0	0	0	0	343223	0	0	39731	169861	0
WC071	0	0	0	0	0	241280	0	0	0	118647	307667	0	341172	0	0

	Route	C001	WC071
363500	Oceanic N	0	0
306000	Enner Glyn	0	0
305900	Omaio	0	0
305800	Suffolk	0	0
303800	Marybank	0	0
303700	Inlets Nelson	0	241280
303600	Nelson Ru	0	0
306200	The Brook	0	0
306100	Daelyn	0	0
305300	Rutherford	343223	118647
304200	Britannia	0	307667
304100	Tahunanui	0	0
304700	Nelson Ce	39731	341172
304600	Tahuna Hill	169861	0
304400	Broadgreen	0	0
305600	Grampians	561222	0
304300	Atawhai	0	0
304000	Nelson Air	0	0
304500	Washington	7450	448391
303900	Port Nelson	0	31487
305700	Saxton	0	0
305500	Maitai	0	0
305400	Maitlands	0	0
305200	Victory	121910	0
305100	Aldinga	0	0
305000	Nayland	0	0
304900	Toi Toi	370360	0
304800	The Wood	0	0

305600	304300	304000	304500	303900	305700	305500	305400	305200	305100	305000	304900	304800	
Grampians	Atawhai	Nelson Air	Washington	Port Nelso	Saxton	Maitai	Maitlands	Victory	Aldinga	Nayland	Toi Toi	The Wood	Total
561222	0	0	7450	0	0	0	0	121910	0	0	370360	0	1613757
0	0	0	448391	31487	0	0	0	0	0	0	0	0	1488644
												Total	3102401
												Check	TRUE

ID	SA22018_V1	SA22018__1	Area
C001	305300	Rutherford	165826
WC071	305300	Rutherford	165826
C001	304900	Toi Toi	142183
WC071	304900	Toi Toi	142183
C001	304500	Washington	89301
WC071	304500	Washington	89301
C001	304700	Nelson Central-Trafalgar	21946
WC071	304700	Nelson Central-Trafalgar	21946
WC071	304700	Nelson Central-Trafalgar	583649
WC071	305300	Rutherford	42153
WC071	304500	Washington	72740
WC071	304600	Tahuna Hills	219085
WC071	304200	Britannia	170515
WC071	303700	Inlets Nelson City	1348607
WC071	304800	The Wood	187094
WC071	304900	Toi Toi	24284
C001	304600	Tahuna Hills	803056
C001	305600	Grampians	1244930
WC071	363500	Oceanic Nelson Region	20537
WC071	303900	Port Nelson	470630
C001	306200	The Brook	544550
C001	306000	Enner Glynn	91406
C001	305300	Rutherford	178014
C001	304900	Toi Toi	486612
			7326371

	363500	306000	305900	305800	303800	303700	303600	306200	306100	305300	304200	304100	304700
Route	Oceanic N	Enner Glyr	Omaio	Suffolk	Marybank	Inlets Nels	Nelson Ru	The Brook	Daelyn	Rutherford	Britannia	Tahunanui	Nelson Ce
C001	0	91406	0	0	0	0	0	544550	0	343840	0	0	21946
WC071	20537	0	0	0	0	1348607	0	0	0	207979	170515	0	605595

	Route	C001	WC071
363500	Oceanic N	0	20537
306000	Enner Glyr	91406	0
305900	Omaio	0	0
305800	Suffolk	0	0
303800	Marybank	0	0
303700	Inlets Nels	0	1348607
303600	Nelson Ru	0	0
306200	The Brook	544550	0
306100	Daelyn	0	0
305300	Rutherford	343840	207979
304200	Britannia	0	170515
304100	Tahunanui	0	0
304700	Nelson Ce	21946	605595
304600	Tahuna Hill	803056	219085
304400	Broadgree	0	0
305600	Grampians	1244930	0
304300	Atawhai	0	0
304000	Nelson Air	0	0
304500	Washingto	89301	162041
303900	Port Nelso	0	470630
305700	Saxton	0	0
305500	Maitai	0	0
305400	Maitlands	0	0
305200	Victory	0	0
305100	Aldinga	0	0
305000	Nayland	0	0
304900	Toi Toi	628795	166467
304800	The Wood	0	187094

304600	304400	305600	304300	304000	304500	303900	305700	305500	305400	305200	305100	305000	304900	304800	
Tahuna Hill	Broadgreen	Grampians	Atawhai	Nelson Air	Washington	Port Nelson	Saxton	Maitai	Maitlands	Victory	Aldinga	Nayland	Toi Toi	The Wood	Total
803056	0	1244930	0	0	89301	0	0	0	0	0	0	0	628795	0	3767823
219085	0	0	0	0	162041	470630	0	0	0	0	0	0	166467	187094	3558549
														Total	7326371
														Check	TRUE

codedcras	Social Co	Crash ider	Crash sev	Number of	Police atte	Number of	Simple / c	Fatal injur	Serious inj	Minor injur	Non-injury	Watch hou	Three hou	Four hour	Financial	Crash year	Crash date	Crash time	Day of the	Month of y	Is weeken	Holiday	Alternative	Auckland	Geospatia	Road cate	Census ar	NZTA net	NZTA Reg	RSR Peer	RSR Peer	Deprivation	Deprivation	One Netw	AKL local
1070003	1057000	2.02E+08	Serious Cr	2	Yes	0	Multiple P	0	1	0	1	No	06:00-08:5	04:00-07:5	2015/2016	2016	#####	7:50	Thursday	March	No			WAIMEA	Arterial ur	Bronte	Nelson Ta	South Islar	Major urba	B		1707	6		
1070693	100000	2.02E+08	Minor Cras	2	Yes	0	Multiple P	0	0	1	1	No	15:00-17:5	16:00-19:5	2015/2016	2016	#####	17:25	Thursday	May	No			WAIMEA	Arterial ur	Bronte	Nelson Ta	South Islar	Major urba	B		1707	6		
1154204	100000	2.02E+08	Minor Cras	2	Yes	0	Multiple P	0	0	1	1	No	15:00-17:5	12:00-15:5	2018/2019	2018	5/11/2018	15:34	Monday	November	No			WAIMEA	Arterial ur	Bronte	Nelson Ta	South Islar	Major urba	B		1707	6		
1181610	24147	2.02E+08	Non-Injury	2	Yes	0	Multiple P	0	0	0	2	No	15:00-17:5	12:00-15:5	2018/2019	2018	#####	15:03	Monday	December	No			WAIMEA	Arterial ur	Grampian	Nelson Ta	South Islar	Major urba	B		2331	6		
1194588	100000	2.02E+08	Minor Cras	2	No	0	Multiple P	0	0	1	1	No	09:00-11:5	08:00-11:5	2019/2020	2019	#####	9:00	Wednesda	July	No			HAMPDEN	Minor urba	Bronte	Nelson Ta	South Islar	Major urba	B		1707	8		

Police dist	Regional d	TLA (Territ	Police are	Police sta	Locality/su	Reference	Route pos	Is in scho	Crash roa	Intersecti	Side road	Feature	Direction f	Distance f	Distance f	Intersecti	Outdated	Off road lo	On state h	Urban or c	Northing	Easting	Longitude	Latitude	Object str	Object str	Object str	Object str	Movement	Movement	Road Safety report moveme	Posted sp	Temp spe	
Tasman	Nelson Re	Nelson Cit	Nelson Ba	Nelson Ce	Nelson South			Yes	WAIMEA	Yes	HAMPDEN ST	Null		0	0	Intersection	No	Null	No	Urban	5429648	1623156	173.2765	-41.2843						Xing Not T	HA	Crossing/Turning	50	0
Tasman	Nelson Re	Nelson Cit	Nelson Ba	Nelson Ce	Nelson South			Yes	WAIMEA	Yes	HAMPDEN ST	Null		0	0	Intersection	No	Null	No	Urban	5429648	1623156	173.2765	-41.2843						One Turns	LB	Crossing/Turning	50	0
Tasman	Nelson Re	Nelson Cit	Nelson Ba	Nelson Ce	Nelson South			Yes	WAIMEA	Yes	HAMPDEN STREET	Null		0	0	Intersection	No	Null	No	Urban	5429642	1623152	173.2765	-41.2843						Merging	KA	Crossing/Turning	50	0
Tasman	Nelson Re	Nelson Cit	Nelson Ba	Nelson Ce	Nelson South			Yes	HAMPDEN	Yes	WAIMEA ROAD	Null		0	0	Intersection	No	Null	No	Urban	5429651	1623153	173.2765	-41.2842						Xing Not T	HA	Crossing/Turning	50	0

Advisory s	Road mark	Road type	Number of	Special pu	Road feat	Rail cross	Junction ty	Road curv	Gradient	Surface ty	Primary su	Traffic con	Street ligh	Natural Lig	Primary w	Secondary	Vehicle 1	Vehicle 2	Vehicle 3	Vehicle 4	Vehicle 1	Why crash	Why crash	What happ	Why crash	Objects hi	Why crash	Why crash	Vehicle 1	Vehicle 2	Vehicle 3	Vehicle 4	Cycle Path	ID
	Paint island	2-way	2	Null	Nil	Null	Crossroad	Straight	Hill Road	Sealed	Dry	Give way	Null	Bright sun	Fine	Null	Cycle	Car/Wagon			North	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	301,375				Waimea/H	C001
	No passing	2-way	3	Null	Nil	Null	Crossroad	Straight	Hill Road	Sealed	Dry	Give way	Off	Twilight	Fine	Null	Cycle	SUV			North	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	see TCR image	#####				Waimea/H	C001
	Paint island	2-way	2	Null	Nil	Null	Crossroad	Straight	Hill Road	Sealed	Dry	Give way	Null	Bright sun	Fine	Null	Cycle	Car/Wagon			South	Bike going	Nil.	Cyclist Joe	Bright sun	Bicycle an	Cross road	Young cyclist.&CR,&l	#####				Waimea/H	C001
	Centre line	2-way	2	Cycle	Nil	Null	Crossroad	Straight	Hill Road	Sealed	Dry	Give way	Off	Bright sun	Fine	Null	Cycle	Car/Wagon			North	N/A	N/A	Cyclist tra	N/A	Car	N/A	Young driver fails to s	#####				Waimea/H	C001
	Centre line	2-way	2	Null	Nil	Null	Crossroad	Straight	Hill Road	Sealed	Wet	Give way	Off	Bright sun	Light rain	Null	Unknown	Cycle			South	Nil	Unknown	Wearing w	Wet road	Busy inter	Unknown	301				Waimea/H	C001	

4 Motueka St – Tipahi St Economics

Total NPV Costs					
	Travel Time Cost	Vehicle Operation Cost	CO2 Cost	Crash Cost	NPV Project Cost
Do Minimum	\$ 18,131,000	\$ 8,362,000	\$ 463,000	\$ 3,011,000	
Preferred Option	\$ 22,430,000	\$ 7,931,000	\$ 439,000	\$ 1,828,000	\$ 9,657,000

Total NPV Benefits						
	Travel Time Benefit	Vehicle Operation Benefit	CO2 Benefit	Crash Benefit	Health Benefit	BCR
Preferred Option	-\$ 4,299,000	\$ 431,000	\$ 24,000	\$ 1,183,000	\$ 15,758,550	1.4

Assumptions	
Discount Rate	4%

Do Minimum										
	Year	DF	TT	Discounted	VOC	Discounted	CO2	Discounted	Crash Cost	Discounted
	2018		\$ 449,275		\$ 290,621		\$ 17,687		\$ 133,217	
	2019		\$ 455,449		\$ 294,702		\$ 17,935		\$ 133,384	
0	2020	1	\$ 461,622	\$ 461,622	\$ 298,784	\$ 298,784	\$ 18,183	\$ 18,183	\$ 133,551	\$ 133,551
1	2021	0.961538	\$ 467,796	\$ 449,804	\$ 302,865	\$ 291,216	\$ 18,432	\$ 17,723	\$ 133,718	\$ 128,575
2	2022	0.924556	\$ 473,970	\$ 438,212	\$ 306,947	\$ 283,789	\$ 18,680	\$ 17,271	\$ 133,884	\$ 123,784
3	2023	0.888996	\$ 480,144	\$ 426,846	\$ 311,028	\$ 276,503	\$ 18,929	\$ 16,827	\$ 134,051	\$ 119,171
4	2024	0.854804	\$ 486,317	\$ 415,706	\$ 315,109	\$ 269,357	\$ 19,177	\$ 16,393	\$ 134,218	\$ 114,730
5	2025	0.821927	\$ 492,491	\$ 404,792	\$ 319,191	\$ 262,352	\$ 19,425	\$ 15,966	\$ 134,385	\$ 110,454
6	2026	0.790315	\$ 498,665	\$ 394,102	\$ 323,272	\$ 255,487	\$ 19,674	\$ 15,548	\$ 134,551	\$ 106,338
7	2027	0.759918	\$ 504,839	\$ 383,636	\$ 327,354	\$ 248,762	\$ 19,922	\$ 15,139	\$ 134,718	\$ 102,375
8	2028	0.73069	\$ 511,012	\$ 373,392	\$ 331,435	\$ 242,176	\$ 20,171	\$ 14,738	\$ 134,885	\$ 98,559
9	2029	0.702587	\$ 519,787	\$ 365,195	\$ 336,920	\$ 236,716	\$ 20,504	\$ 14,406	\$ 136,262	\$ 95,736
10	2030	0.675564	\$ 528,561	\$ 357,077	\$ 342,405	\$ 231,316	\$ 20,838	\$ 14,078	\$ 137,639	\$ 92,984
11	2031	0.649581	\$ 537,336	\$ 349,043	\$ 347,890	\$ 225,983	\$ 21,172	\$ 13,753	\$ 139,017	\$ 90,303
12	2032	0.624597	\$ 546,111	\$ 341,099	\$ 353,375	\$ 220,717	\$ 21,506	\$ 13,432	\$ 140,394	\$ 87,690
13	2033	0.600574	\$ 554,885	\$ 333,250	\$ 358,859	\$ 215,522	\$ 21,840	\$ 13,116	\$ 141,772	\$ 85,144
14	2034	0.577475	\$ 563,660	\$ 325,499	\$ 364,344	\$ 210,400	\$ 22,173	\$ 12,805	\$ 143,149	\$ 82,665
15	2035	0.555265	\$ 572,434	\$ 317,852	\$ 369,829	\$ 205,353	\$ 22,507	\$ 12,497	\$ 144,526	\$ 80,250
16	2036	0.533908	\$ 581,209	\$ 310,312	\$ 375,314	\$ 200,383	\$ 22,841	\$ 12,195	\$ 145,904	\$ 77,899
17	2037	0.513373	\$ 589,983	\$ 302,882	\$ 380,799	\$ 195,492	\$ 23,175	\$ 11,897	\$ 147,281	\$ 75,610
18	2038	0.493628	\$ 598,758	\$ 295,564	\$ 386,283	\$ 190,680	\$ 23,509	\$ 11,604	\$ 148,658	\$ 73,382
19	2039	0.474642	\$ 607,532	\$ 288,361	\$ 391,768	\$ 185,950	\$ 23,842	\$ 11,317	\$ 150,036	\$ 71,213
20	2040	0.456387	\$ 616,307	\$ 281,274	\$ 397,253	\$ 181,301	\$ 24,176	\$ 11,034	\$ 151,413	\$ 69,103
21	2041	0.438834	\$ 625,081	\$ 274,307	\$ 402,738	\$ 176,735	\$ 24,510	\$ 10,756	\$ 152,790	\$ 67,050
22	2042	0.421955	\$ 633,856	\$ 267,459	\$ 408,223	\$ 172,252	\$ 24,844	\$ 10,483	\$ 154,168	\$ 65,052
23	2043	0.405726	\$ 642,630	\$ 260,732	\$ 413,708	\$ 167,852	\$ 25,178	\$ 10,215	\$ 155,545	\$ 63,109
24	2044	0.390121	\$ 651,405	\$ 254,127	\$ 419,192	\$ 163,536	\$ 25,511	\$ 9,953	\$ 156,923	\$ 61,219
25	2045	0.375117	\$ 660,179	\$ 247,644	\$ 424,677	\$ 159,304	\$ 25,845	\$ 9,695	\$ 158,300	\$ 59,381
26	2046	0.360689	\$ 668,954	\$ 241,284	\$ 430,162	\$ 155,155	\$ 26,179	\$ 9,442	\$ 159,677	\$ 57,594
27	2047	0.346817	\$ 677,728	\$ 235,047	\$ 435,647	\$ 151,090	\$ 26,513	\$ 9,195	\$ 161,055	\$ 55,856
28	2048	0.333477	\$ 686,503	\$ 228,933	\$ 441,132	\$ 147,107	\$ 26,846	\$ 8,953	\$ 162,432	\$ 54,167
29	2049	0.320651	\$ 686,503	\$ 220,128	\$ 441,132	\$ 141,450	\$ 26,846	\$ 8,608	\$ 162,432	\$ 52,084
30	2050	0.308319	\$ 686,503	\$ 211,662	\$ 441,132	\$ 136,009	\$ 26,846	\$ 8,277	\$ 162,432	\$ 50,081
31	2051	0.29646	\$ 686,503	\$ 203,521	\$ 441,132	\$ 130,778	\$ 26,846	\$ 7,959	\$ 162,432	\$ 48,155
32	2052	0.285058	\$ 686,503	\$ 195,693	\$ 441,132	\$ 125,748	\$ 26,846	\$ 7,653	\$ 162,432	\$ 46,303
33	2053	0.274094	\$ 686,503	\$ 188,166	\$ 441,132	\$ 120,912	\$ 26,846	\$ 7,358	\$ 162,432	\$ 44,522
34	2054	0.263552	\$ 686,503	\$ 180,929	\$ 441,132	\$ 116,261	\$ 26,846	\$ 7,075	\$ 162,432	\$ 42,809
35	2055	0.253415	\$ 686,503	\$ 173,970	\$ 441,132	\$ 111,790	\$ 26,846	\$ 6,803	\$ 162,432	\$ 41,163
36	2056	0.243669	\$ 686,503	\$ 167,279	\$ 441,132	\$ 107,490	\$ 26,846	\$ 6,542	\$ 162,432	\$ 39,580
37	2057	0.234297	\$ 686,503	\$ 160,845	\$ 441,132	\$ 103,356	\$ 26,846	\$ 6,290	\$ 162,432	\$ 38,057
38	2058	0.225285	\$ 686,503	\$ 154,659	\$ 441,132	\$ 99,381	\$ 26,846	\$ 6,048	\$ 162,432	\$ 36,594
39	2059	0.216621	\$ 686,503	\$ 148,711	\$ 441,132	\$ 95,558	\$ 26,846	\$ 5,816	\$ 162,432	\$ 35,186
40	2060	0.208289	\$ 686,503	\$ 142,991	\$ 441,132	\$ 91,883	\$ 26,846	\$ 5,592	\$ 162,432	\$ 33,833
	Total	20.7928	\$ 25,582,511	\$ 11,773,609	\$ 16,495,407	\$ 7,601,883	\$ 1,003,881	\$ 462,637	\$ 6,410,687	\$ 3,011,309

TT	Discounted	Step Change
\$ 449,275		
\$ 473,571		
\$ 497,868	\$ 497,868	\$ 461,622
\$ 522,164	\$ 502,081	\$ 449,804
\$ 546,461	\$ 505,233	\$ 438,212
\$ 570,757	\$ 507,401	\$ 426,846
\$ 595,053	\$ 508,654	\$ 415,706
\$ 619,350	\$ 509,060	\$ 509,060
\$ 643,646	\$ 508,683	\$ 508,683
\$ 667,942	\$ 507,581	\$ 507,581
\$ 692,239	\$ 505,812	\$ 505,812
\$ 700,966	\$ 492,490	\$ 492,490
\$ 709,694	\$ 479,444	\$ 479,444
\$ 718,421	\$ 466,673	\$ 466,673
\$ 727,149	\$ 454,175	\$ 454,175
\$ 735,876	\$ 441,948	\$ 441,948
\$ 744,604	\$ 429,990	\$ 429,990
\$ 753,331	\$ 418,298	\$ 418,298
\$ 762,059	\$ 406,869	\$ 406,869
\$ 770,786	\$ 395,701	\$ 395,701
\$ 779,514	\$ 384,790	\$ 384,790
\$ 788,241	\$ 374,133	\$ 374,133
\$ 796,969	\$ 363,726	\$ 363,726
\$ 805,696	\$ 353,566	\$ 353,566
\$ 814,423	\$ 343,650	\$ 343,650
\$ 823,151	\$ 333,974	\$ 333,974
\$ 831,878	\$ 324,534	\$ 324,534
\$ 840,606	\$ 315,325	\$ 315,325
\$ 849,333	\$ 306,345	\$ 306,345
\$ 858,061	\$ 297,590	\$ 297,590
\$ 866,788	\$ 289,054	\$ 289,054
\$ 866,788	\$ 277,937	\$ 277,937
\$ 866,788	\$ 267,247	\$ 267,247
\$ 866,788	\$ 256,968	\$ 256,968
\$ 866,788	\$ 247,085	\$ 247,085
\$ 866,788	\$ 237,582	\$ 237,582
\$ 866,788	\$ 228,444	\$ 228,444
\$ 866,788	\$ 219,658	\$ 219,658
\$ 866,788	\$ 211,209	\$ 211,209
\$ 866,788	\$ 203,086	\$ 203,086
\$ 866,788	\$ 195,275	\$ 195,275
\$ 866,788	\$ 187,764	\$ 187,764
\$ 866,788	\$ 180,543	\$ 180,543
\$ 32,357,331	\$ 14,937,445	\$ 14,608,399

Update Factor	1.540	1.100	1.000	1.000
NPV	\$ 18,131,358	\$ 8,362,071	\$ 462,637	\$ 3,011,309

Update Factor	1.540
NPV	\$ 22,496,935

Walking and Cycling and PT Service Improvements									
VOC	Discounted	Step Change	CO2	Discounted	Step Change	Crash Cost	Discounted	Step Change	Notes
\$ 290,621			\$ 17,687			\$ 133,217			
\$ 293,871			\$ 17,884			\$ 123,424			
\$ 297,122	\$ 297,122	\$ 298,784	\$ 18,082	\$ 18,082	\$ 18,183	\$ 113,631	\$ 113,631	\$ 133,551	
\$ 300,373	\$ 288,820	\$ 291,216	\$ 18,280	\$ 17,577	\$ 17,723	\$ 103,838	\$ 99,844	\$ 128,575	
\$ 303,623	\$ 280,717	\$ 283,789	\$ 18,478	\$ 17,084	\$ 17,271	\$ 94,045	\$ 86,950	\$ 123,784	Option Construction
\$ 306,874	\$ 272,810	\$ 276,503	\$ 18,676	\$ 16,603	\$ 16,827	\$ 84,252	\$ 74,900	\$ 119,171	Option Construction
\$ 310,124	\$ 265,096	\$ 269,357	\$ 18,874	\$ 16,133	\$ 16,393	\$ 74,459	\$ 63,648	\$ 114,730	Option Construction
\$ 313,375	\$ 257,571	\$ 257,571	\$ 19,071	\$ 15,675	\$ 15,675	\$ 64,666	\$ 53,151	\$ 53,151	
\$ 316,625	\$ 250,234	\$ 250,234	\$ 19,269	\$ 15,229	\$ 15,229	\$ 54,873	\$ 43,367	\$ 43,367	
\$ 319,876	\$ 243,079	\$ 243,079	\$ 19,467	\$ 14,793	\$ 14,793	\$ 45,080	\$ 34,257	\$ 34,257	
\$ 323,127	\$ 236,105	\$ 236,105	\$ 19,665	\$ 14,369	\$ 14,369	\$ 35,287	\$ 25,784	\$ 25,784	
\$ 326,828	\$ 229,625	\$ 229,625	\$ 19,890	\$ 13,975	\$ 13,975	\$ 35,470	\$ 24,920	\$ 24,920	
\$ 330,530	\$ 223,294	\$ 223,294	\$ 20,115	\$ 13,589	\$ 13,589	\$ 35,652	\$ 24,085	\$ 24,085	
\$ 334,231	\$ 217,110	\$ 217,110	\$ 20,341	\$ 13,213	\$ 13,213	\$ 35,835	\$ 23,278	\$ 23,278	
\$ 337,933	\$ 211,072	\$ 211,072	\$ 20,566	\$ 12,845	\$ 12,845	\$ 36,018	\$ 22,497	\$ 22,497	
\$ 341,634	\$ 205,177	\$ 205,177	\$ 20,791	\$ 12,487	\$ 12,487	\$ 36,201	\$ 21,741	\$ 21,741	
\$ 345,336	\$ 199,423	\$ 199,423	\$ 21,017	\$ 12,137	\$ 12,137	\$ 36,384	\$ 21,011	\$ 21,011	
\$ 349,037	\$ 193,808	\$ 193,808	\$ 21,242	\$ 11,795	\$ 11,795	\$ 36,567	\$ 20,304	\$ 20,304	
\$ 352,739	\$ 188,330	\$ 188,330	\$ 21,467	\$ 11,461	\$ 11,461	\$ 36,750	\$ 19,621	\$ 19,621	
\$ 356,440	\$ 182,987	\$ 182,987	\$ 21,692	\$ 11,136	\$ 11,136	\$ 36,932	\$ 18,960	\$ 18,960	
\$ 360,142	\$ 177,776	\$ 177,776	\$ 21,918	\$ 10,819	\$ 10,819	\$ 37,115	\$ 18,321	\$ 18,321	
\$ 363,843	\$ 172,695	\$ 172,695	\$ 22,143	\$ 10,510	\$ 10,510	\$ 37,298	\$ 17,703	\$ 17,703	
\$ 367,545	\$ 167,743	\$ 167,743	\$ 22,368	\$ 10,209	\$ 10,209	\$ 37,481	\$ 17,106	\$ 17,106	
\$ 371,246	\$ 162,915	\$ 162,915	\$ 22,593	\$ 9,915	\$ 9,915	\$ 37,664	\$ 16,528	\$ 16,528	
\$ 374,948	\$ 158,211	\$ 158,211	\$ 22,819	\$ 9,628	\$ 9,628	\$ 37,847	\$ 15,970	\$ 15,970	
\$ 378,649	\$ 153,628	\$ 153,628	\$ 23,044	\$ 9,350	\$ 9,350	\$ 38,030	\$ 15,430	\$ 15,430	
\$ 382,351	\$ 149,163	\$ 149,163	\$ 23,269	\$ 9,078	\$ 9,078	\$ 38,212	\$ 14,908	\$ 14,908	
\$ 386,052	\$ 144,815	\$ 144,815	\$ 23,494	\$ 8,813	\$ 8,813	\$ 38,395	\$ 14,403	\$ 14,403	
\$ 389,754	\$ 140,580	\$ 140,580	\$ 23,720	\$ 8,555	\$ 8,555	\$ 38,578	\$ 13,915	\$ 13,915	
\$ 393,455	\$ 136,457	\$ 136,457	\$ 23,945	\$ 8,305	\$ 8,305	\$ 38,761	\$ 13,443	\$ 13,443	
\$ 397,157	\$ 132,443	\$ 132,443	\$ 24,170	\$ 8,060	\$ 8,060	\$ 38,944	\$ 12,987	\$ 12,987	
\$ 397,157	\$ 127,349	\$ 127,349	\$ 24,170	\$ 7,750	\$ 7,750	\$ 38,944	\$ 12,487	\$ 12,487	
\$ 397,157	\$ 122,451	\$ 122,451	\$ 24,170	\$ 7,452	\$ 7,452	\$ 38,944	\$ 12,007	\$ 12,007	
\$ 397,157	\$ 117,741	\$ 117,741	\$ 24,170	\$ 7,166	\$ 7,166	\$ 38,944	\$ 11,545	\$ 11,545	
\$ 397,157	\$ 113,213	\$ 113,213	\$ 24,170	\$ 6,890	\$ 6,890	\$ 38,944	\$ 11,101	\$ 11,101	
\$ 397,157	\$ 108,858	\$ 108,858	\$ 24,170	\$ 6,625	\$ 6,625	\$ 38,944	\$ 10,674	\$ 10,674	
\$ 397,157	\$ 104,672	\$ 104,672	\$ 24,170	\$ 6,370	\$ 6,370	\$ 38,944	\$ 10,264	\$ 10,264	
\$ 397,157	\$ 100,646	\$ 100,646	\$ 24,170	\$ 6,125	\$ 6,125	\$ 38,944	\$ 9,869	\$ 9,869	
\$ 397,157	\$ 96,775	\$ 96,775	\$ 24,170	\$ 5,890	\$ 5,890	\$ 38,944	\$ 9,489	\$ 9,489	
\$ 397,157	\$ 93,053	\$ 93,053	\$ 24,170	\$ 5,663	\$ 5,663	\$ 38,944	\$ 9,124	\$ 9,124	
\$ 397,157	\$ 89,474	\$ 89,474	\$ 24,170	\$ 5,445	\$ 5,445	\$ 38,944	\$ 8,773	\$ 8,773	
\$ 397,157	\$ 86,032	\$ 86,032	\$ 24,170	\$ 5,236	\$ 5,236	\$ 38,944	\$ 8,436	\$ 8,436	
\$ 397,157	\$ 82,723	\$ 82,723	\$ 24,170	\$ 5,034	\$ 5,034	\$ 38,944	\$ 8,112	\$ 8,112	
\$ 15,381,341	\$ 7,181,790	\$ 7,196,876	\$ 936,081	\$ 437,071	\$ 437,989	\$ 2,138,233	\$ 1,084,544	\$ 1,265,381	

		1.100			1.000			1.000	
		\$ 7,916,564			\$ 437,989			\$ 1,265,381	

TT	Discounted	Step Change
\$ 449,275		
\$ 466,224		
\$ 483,174	\$ 483,174	\$ 461,622
\$ 500,124	\$ 480,888	\$ 449,804
\$ 517,073	\$ 478,063	\$ 438,212
\$ 534,023	\$ 474,744	\$ 426,846
\$ 550,972	\$ 470,973	\$ 415,706
\$ 567,922	\$ 466,790	\$ 509,060
\$ 584,871	\$ 462,232	\$ 508,683
\$ 601,821	\$ 457,334	\$ 507,581
\$ 618,770	\$ 452,129	\$ 505,812
\$ 632,180	\$ 444,162	\$ 492,490
\$ 645,591	\$ 436,138	\$ 479,444
\$ 659,001	\$ 428,075	\$ 466,673
\$ 672,412	\$ 419,986	\$ 454,175
\$ 685,822	\$ 411,887	\$ 441,948
\$ 699,232	\$ 403,789	\$ 403,789
\$ 712,643	\$ 395,705	\$ 395,705
\$ 726,053	\$ 387,646	\$ 387,646
\$ 739,464	\$ 379,621	\$ 379,621
\$ 752,874	\$ 371,640	\$ 371,640
\$ 766,285	\$ 363,711	\$ 363,711
\$ 779,695	\$ 355,843	\$ 355,843
\$ 793,105	\$ 348,041	\$ 348,041
\$ 806,516	\$ 340,314	\$ 340,314
\$ 819,926	\$ 332,666	\$ 332,666
\$ 833,337	\$ 325,102	\$ 325,102
\$ 846,747	\$ 317,629	\$ 317,629
\$ 860,157	\$ 310,249	\$ 310,249
\$ 873,568	\$ 302,968	\$ 302,968
\$ 886,978	\$ 295,787	\$ 295,787
\$ 886,978	\$ 284,411	\$ 284,411
\$ 886,978	\$ 273,472	\$ 273,472
\$ 886,978	\$ 262,954	\$ 262,954
\$ 886,978	\$ 252,840	\$ 252,840
\$ 886,978	\$ 243,116	\$ 243,116
\$ 886,978	\$ 233,765	\$ 233,765
\$ 886,978	\$ 224,774	\$ 224,774
\$ 886,978	\$ 216,129	\$ 216,129
\$ 886,978	\$ 207,816	\$ 207,816
\$ 886,978	\$ 199,823	\$ 199,823
\$ 886,978	\$ 192,138	\$ 192,138
\$ 886,978	\$ 184,748	\$ 184,748
\$ 31,709,572	\$ 14,373,272	\$ 14,564,753

Update Factor		1.540
NPV		\$ 22,429,719

Preferred Option

VOC	Discounted	Step Change	CO2	Discounted	Step Change	Crash Cost	Discounted	Step Change	Health Benefit	Discounted	Step Change	Project Cost	Discounted
\$ 290,621			\$ 17,687			\$ 133,217			\$ -				
\$ 291,089			\$ 17,715			\$ 128,875			\$ -				
\$ 291,557	\$ 291,557	\$ 298,784	\$ 17,744	\$ 17,744	\$ 18,183	\$ 124,533	\$ 124,533	\$ 133,551	\$ -	\$ -	\$ -		
\$ 292,025	\$ 280,793	\$ 291,216	\$ 17,772	\$ 17,089	\$ 17,723	\$ 120,191	\$ 115,568	\$ 128,575	\$ -	\$ -	\$ -		
\$ 292,493	\$ 270,426	\$ 283,789	\$ 17,801	\$ 16,458	\$ 17,271	\$ 115,849	\$ 107,109	\$ 123,784	\$ -	\$ -	\$ -	\$ 3,619,253	\$ 3,346,203
\$ 292,961	\$ 260,441	\$ 276,503	\$ 17,829	\$ 15,850	\$ 16,827	\$ 111,507	\$ 99,129	\$ 119,171	\$ 807,600	\$ 717,953	\$ -	\$ 3,619,253	\$ 3,217,503
\$ 293,429	\$ 250,824	\$ 269,357	\$ 17,858	\$ 15,265	\$ 16,393	\$ 107,164	\$ 91,605	\$ 114,730	\$ 819,360	\$ 700,392	\$ -	\$ 3,619,253	\$ 3,093,752
\$ 293,897	\$ 241,562	\$ 257,571	\$ 17,886	\$ 14,701	\$ 15,675	\$ 102,822	\$ 84,512	\$ 53,151	\$ 831,120	\$ 683,120	\$ 683,120		
\$ 294,365	\$ 232,641	\$ 250,234	\$ 17,915	\$ 14,158	\$ 15,229	\$ 98,480	\$ 77,830	\$ 43,367	\$ 842,880	\$ 666,140	\$ 666,140		
\$ 294,833	\$ 224,049	\$ 243,079	\$ 17,943	\$ 13,635	\$ 14,793	\$ 94,138	\$ 71,537	\$ 34,257	\$ 854,640	\$ 649,456	\$ 649,456		
\$ 295,301	\$ 215,773	\$ 236,105	\$ 17,971	\$ 13,132	\$ 14,369	\$ 89,796	\$ 65,613	\$ 25,784	\$ 866,400	\$ 633,070	\$ 633,070		
\$ 300,983	\$ 211,466	\$ 229,625	\$ 18,317	\$ 12,869	\$ 13,975	\$ 90,174	\$ 63,355	\$ 24,920	\$ 878,160	\$ 616,984	\$ 616,984		
\$ 306,665	\$ 207,172	\$ 223,294	\$ 18,663	\$ 12,608	\$ 13,589	\$ 90,551	\$ 61,173	\$ 24,085	\$ 889,920	\$ 601,198	\$ 601,198		
\$ 312,347	\$ 202,895	\$ 217,110	\$ 19,009	\$ 12,348	\$ 13,213	\$ 90,929	\$ 59,066	\$ 23,278	\$ 901,680	\$ 585,714	\$ 585,714		
\$ 318,029	\$ 198,640	\$ 211,072	\$ 19,355	\$ 12,089	\$ 12,845	\$ 91,307	\$ 57,030	\$ 22,497	\$ 913,440	\$ 570,532	\$ 570,532		
\$ 323,712	\$ 194,413	\$ 205,177	\$ 19,701	\$ 11,832	\$ 12,487	\$ 91,685	\$ 55,063	\$ 21,741	\$ 925,200	\$ 555,651	\$ 555,651		
\$ 329,394	\$ 190,217	\$ 190,217	\$ 20,046	\$ 11,576	\$ 11,576	\$ 92,062	\$ 53,164	\$ 53,164	\$ 936,960	\$ 541,071	\$ 541,071		
\$ 335,076	\$ 186,056	\$ 186,056	\$ 20,392	\$ 11,323	\$ 11,323	\$ 92,440	\$ 51,329	\$ 51,329	\$ 948,720	\$ 526,791	\$ 526,791		
\$ 340,758	\$ 181,934	\$ 181,934	\$ 20,738	\$ 11,072	\$ 11,072	\$ 92,818	\$ 49,556	\$ 49,556	\$ 960,480	\$ 512,808	\$ 512,808		
\$ 346,440	\$ 177,853	\$ 177,853	\$ 21,084	\$ 10,824	\$ 10,824	\$ 93,196	\$ 47,844	\$ 47,844	\$ 972,240	\$ 499,122	\$ 499,122		
\$ 352,123	\$ 173,818	\$ 173,818	\$ 21,430	\$ 10,578	\$ 10,578	\$ 93,573	\$ 46,190	\$ 46,190	\$ 984,000	\$ 485,730	\$ 485,730		
\$ 357,805	\$ 169,829	\$ 169,829	\$ 21,775	\$ 10,336	\$ 10,336	\$ 93,951	\$ 44,593	\$ 44,593	\$ 995,760	\$ 472,630	\$ 472,630		
\$ 363,487	\$ 165,891	\$ 165,891	\$ 22,121	\$ 10,096	\$ 10,096	\$ 94,329	\$ 43,050	\$ 43,050	\$ 1,007,520	\$ 459,819	\$ 459,819		
\$ 369,169	\$ 162,004	\$ 162,004	\$ 22,467	\$ 9,859	\$ 9,859	\$ 94,707	\$ 41,560	\$ 41,560	\$ 1,019,280	\$ 447,294	\$ 447,294		
\$ 374,851	\$ 158,171	\$ 158,171	\$ 22,813	\$ 9,626	\$ 9,626	\$ 95,084	\$ 40,121	\$ 40,121	\$ 1,031,040	\$ 435,053	\$ 435,053		
\$ 380,534	\$ 154,393	\$ 154,393	\$ 23,159	\$ 9,396	\$ 9,396	\$ 95,462	\$ 38,731	\$ 38,731	\$ 1,042,800	\$ 423,091	\$ 423,091		
\$ 386,216	\$ 150,671	\$ 150,671	\$ 23,504	\$ 9,170	\$ 9,170	\$ 95,840	\$ 37,389	\$ 37,389	\$ 1,054,560	\$ 411,407	\$ 411,407		
\$ 391,898	\$ 147,008	\$ 147,008	\$ 23,850	\$ 8,947	\$ 8,947	\$ 96,218	\$ 36,093	\$ 36,093	\$ 1,066,320	\$ 399,995	\$ 399,995		
\$ 397,580	\$ 143,403	\$ 143,403	\$ 24,196	\$ 8,727	\$ 8,727	\$ 96,595	\$ 34,841	\$ 34,841	\$ 1,078,080	\$ 388,852	\$ 388,852		
\$ 403,263	\$ 139,858	\$ 139,858	\$ 24,542	\$ 8,512	\$ 8,512	\$ 96,973	\$ 33,632	\$ 33,632	\$ 1,089,840	\$ 377,975	\$ 377,975		
\$ 408,945	\$ 136,374	\$ 136,374	\$ 24,888	\$ 8,299	\$ 8,299	\$ 97,351	\$ 32,464	\$ 32,464	\$ 1,101,600	\$ 367,359	\$ 367,359		
\$ 408,945	\$ 131,129	\$ 131,129	\$ 24,888	\$ 7,980	\$ 7,980	\$ 97,351	\$ 31,216	\$ 31,216	\$ 1,101,600	\$ 353,230	\$ 353,230		
\$ 408,945	\$ 126,085	\$ 126,085	\$ 24,888	\$ 7,673	\$ 7,673	\$ 97,351	\$ 30,015	\$ 30,015	\$ 1,101,600	\$ 339,644	\$ 339,644		
\$ 408,945	\$ 121,236	\$ 121,236	\$ 24,888	\$ 7,378	\$ 7,378	\$ 97,351	\$ 28,861	\$ 28,861	\$ 1,101,600	\$ 326,581	\$ 326,581		
\$ 408,945	\$ 116,573	\$ 116,573	\$ 24,888	\$ 7,094	\$ 7,094	\$ 97,351	\$ 27,751	\$ 27,751	\$ 1,101,600	\$ 314,020	\$ 314,020		
\$ 408,945	\$ 112,089	\$ 112,089	\$ 24,888	\$ 6,822	\$ 6,822	\$ 97,351	\$ 26,683	\$ 26,683	\$ 1,101,600	\$ 301,942	\$ 301,942		
\$ 408,945	\$ 107,778	\$ 107,778	\$ 24,888	\$ 6,559	\$ 6,559	\$ 97,351	\$ 25,657	\$ 25,657	\$ 1,101,600	\$ 290,329	\$ 290,329		
\$ 408,945	\$ 103,633	\$ 103,633	\$ 24,888	\$ 6,307	\$ 6,307	\$ 97,351	\$ 24,670	\$ 24,670	\$ 1,101,600	\$ 279,162	\$ 279,162		
\$ 408,945	\$ 99,647	\$ 99,647	\$ 24,888	\$ 6,064	\$ 6,064	\$ 97,351	\$ 23,721	\$ 23,721	\$ 1,101,600	\$ 268,425	\$ 268,425		
\$ 408,945	\$ 95,814	\$ 95,814	\$ 24,888	\$ 5,831	\$ 5,831	\$ 97,351	\$ 22,809	\$ 22,809	\$ 1,101,600	\$ 258,101	\$ 258,101		
\$ 408,945	\$ 92,129	\$ 92,129	\$ 24,888	\$ 5,607	\$ 5,607	\$ 97,351	\$ 21,932	\$ 21,932	\$ 1,101,600	\$ 248,174	\$ 248,174		
\$ 408,945	\$ 88,586	\$ 88,586	\$ 24,888	\$ 5,391	\$ 5,391	\$ 97,351	\$ 21,088	\$ 21,088	\$ 1,101,600	\$ 238,629	\$ 238,629		
\$ 408,945	\$ 85,179	\$ 85,179	\$ 24,888	\$ 5,184	\$ 5,184	\$ 97,351	\$ 20,277	\$ 20,277	\$ 1,101,600	\$ 229,451	\$ 229,451		
\$ 15,229,179	\$ 7,000,007	\$ 7,210,273	\$ 926,821	\$ 426,008	\$ 438,805	\$ 4,270,024	\$ 2,068,361	\$ 1,828,128	\$ 38,038,800	\$ 17,176,896	\$ 15,758,550	\$ 10,857,759	\$ 9,657,458

		1.100			1.000			1.000			1.000		1.000
		\$ 7,931,300			\$ 438,805			\$ 1,828,128			\$ 15,758,550		\$ 9,657,458

Do Minimum Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	366.4	9.5	0.58
2018 IP	281.7	7.4	
2018 PM	425.5	11.2	
2028 Do Min AM	440.3	11.3	0.59
2028 Do Min IP	324.2	8.5	
2028 Do Min PM	447.1	11.8	
2048 Do Min AM	574.8	15.1	0.71
2048 Do Min IP	437.3	11.5	
2048 Do Min PM	575.3	15.5	

Do Minimum				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 449,275	\$ 290,621	\$ 17,687	\$ 133,217	
2028				
\$ 511,012	\$ 331,435	\$ 20,171	\$ 134,885	
2048				
\$ 686,503	\$ 441,132	\$ 26,846	\$ 162,432	

TT and	
Item	Value
TT \$/hr	16.27
VOC cents/km	27.6
Generalised Day	245
Weekdays	245
Other days	120
Assume 0% traffic on other days	0

Walking and Cycling and PT Service Improvements Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	366.4	9.5	0.58
2018 IP	281.7	7.4	
2018 PM	425.5	11.2	
2028 Package 2 AM	412.9	14.2	0.15
2028 Package 2 IP	319	11.7	
2028 Package 2 PM	436.6	16.1	
2048 Package 2 AM	474	16.6	0.17
2048 Package 2 IP	406.9	15.2	
2048 Package 2 PM	490.9	18.4	

Walking and Cycling and PT Service Improvements				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 449,275	\$ 290,621	\$ 17,687	\$ 133,217	
2028				
\$ 692,239	\$ 323,127	\$ 19,665	\$ 35,287	
2048				
\$ 866,788	\$ 397,157	\$ 24,170	\$ 38,944	

Peak to AADT Factor	
Peak	Factor
AM	1.87
IP	10
PM	1.87

Preferred Option Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	366.4	9.5	0.58
2018 IP	281.7	7.4	
2018 PM	425.5	11.2	
2028 Package 2 + 3 AM	443.5	15.2	0.39
2028 Package 2 + 3 IP	282.3	10.1	
2028 Package 2 + 3 PM	382.2	13.8	
2048 Package 2 + 3 AM	471.1	16.2	0.42
2048 Package 2 + 3 IP	422.5	15.8	
2048 Package 2 + 3 PM	503.6	18.3	

Preferred Option				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 449,275	\$ 290,621	\$ 17,687	\$ 133,217	
2028				
\$ 618,770	\$ 295,301	\$ 17,971	\$ 89,796	
2048				
\$ 886,978	\$ 408,945	\$ 24,888	\$ 97,351	

CO2	
Item	Value
LV CO2	0.0009
HCV CO2	0.0016
Generalised CO2	0.000928
CO2 value/ton	\$65.58
LV%	96%
HCV%	4%

Crash Cost	
Item	Value
For 50km/h, Priority X	\$ 230,000
For 50km/h, Signalised X	\$ 220,000

Projects

Franklyn Road / Waimea Road Signalised Inters

VOC
Source and Assumptions
Table 17 Urban Arterial all periods
Table A72 50kph and 0% gradient

Table A72: LCV VOC by speed and gradient (cents/km – July 2015)

Speed (km/h)	Gradient in percent (both directions)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
10	44.2	44.2	44.3	44.3	44.5	44.7	44.9	45.2	45.6	46.1	46.7	47.3	48.1
15	39.2	39.3	39.4	39.5	39.8	40.0	40.4	40.8	41.4	42.0	42.7	43.5	44.4
20	35.5	35.6	35.7	35.9	36.2	36.6	37.0	37.5	38.1	38.8	39.6	40.5	41.5
25	32.9	33.0	33.1	33.3	33.6	34.0	34.5	35.0	35.7	36.4	37.3	38.3	39.4
30	30.9	31.0	31.2	31.4	31.8	32.2	32.7	33.2	33.9	34.7	35.7	36.7	37.8
35	29.6	29.7	29.8	30.1	30.4	30.8	31.4	32.0	32.7	33.5	34.5	35.6	36.8
40	28.6	28.7	28.9	29.2	29.5	29.9	30.5	31.1	31.8	32.7	33.7	34.8	36.0
45	28.0	28.1	28.3	28.5	28.9	29.3	29.9	30.5	31.3	32.2	33.2	34.3	35.6
50	27.6	27.7	27.9	28.2	28.5	29.0	29.5	30.2	31.0	31.9	32.9	34.1	35.4
55	27.5	27.6	27.8	28.0	28.4	28.8	29.4	30.1	30.9	31.8	32.8	34.0	35.3
60	27.5	27.6	27.8	28.0	28.4	28.9	29.4	30.1	30.9	31.9	32.9	34.1	35.5
65	27.7	27.8	27.9	28.2	28.6	29.0	29.6	30.3	31.1	32.0	33.1	34.3	35.7
70	28.0	28.0	28.2	28.5	28.8	29.3	29.9	30.6	31.4	32.3	33.4	34.7	36.0
75	28.3	28.4	28.6	28.8	29.2	29.7	30.2	30.9	31.8	32.7	33.8	35.1	36.4
80	28.8	28.9	29.0	29.3	29.6	30.1	30.7	31.4	32.2	33.2	34.3	35.5	36.9
85	29.3	29.4	29.5	29.8	30.1	30.6	31.2	31.9	32.7	33.7	34.8	36.1	37.5
90	29.9	30.0	30.1	30.4	30.7	31.2	31.8	32.5	33.3	34.3	35.4	36.7	38.1
95	30.5	30.6	30.7	31.0	31.3	31.8	32.4	33.1	34.0	34.9	36.1	37.3	38.8
100	31.2	31.3	31.4	31.7	32.0	32.5	33.1	33.8	34.6	35.6	36.7	38.0	39.5
105	31.9	32.0	32.1	32.4	32.7	33.2	33.8	34.5	35.3	36.3	37.5	38.8	40.2
110	32.7	32.7	32.9	33.1	33.4	33.9	34.5	35.2	36.1	37.1	38.2	39.5	41.0
115	33.5	33.5	33.6	33.9	34.2	34.7	35.3	36.0	36.8	37.8	39.0	40.3	41.7
120	34.3	34.3	34.4	34.7	35.0	35.5	36.1	36.8	37.6	38.6	39.8	41.1	42.5

2
Source and Assumptions
MBCM
MBCM
MBCM
Average observation from SATURN model
Average observation from SATURN model

Road links

For road links, vehicle operating costs (VOC, 2015 base date) are calculated by summing running costs and roughness costs. The fuel cost component of running costs is approximately 50%, while for roughness costs the fuel cost component is negligible.

The following formulae can be used to determine CO₂ emissions:

- light vehicle CO₂ (in tonnes) = VOC(\$)/0.0009
- heavy vehicle CO₂ (in tonnes) = VOC(\$)/0.0016.

The value of NZ\$65.58 per tonne of CO₂ (as at June 2016) should be used for project evaluation. This is based on the [Austroads \(2012\)](#) value.

Cost
Source and Assumptions
Crash Estimation Compendium
Crash Estimation Compendium

Table A28: Cost per reported injury crash (\$000 2015)

Crash site/type	Speed limit area (\$000 2015)			
	50km/h	70km/h	100km/h near rural	100km/h remote rural
All other sites	220	340	580	905
Mid-block crashes	275	435	585	850
Intersection crashes:				
Uncontrolled T	195	375	530	820
Roundabout	210	340	545	645
Priority T & Y	240	295	565	880
Priority X	230	305	575	890
Signalised T, Y	235	280	545	855
Signalised X	220	265	620	960

	Project Expected Estimate	95th percentile Project Estimate	Construction Period	Separate Spreadsheet
section + PT Priority	\$ 10,857,759	\$ 13,321,040	2022 - end of 2024	Cost_Franklyn_Waimea signalised intersection DBE May 2021.xls

Do Minimum

2018 - Do Min - AM		2028 - Do Min - AM		2048 - Do Min - AM	
Travel Speed (Average)	38.7 km/h	Travel Speed (Average)	38.8 km/h	Travel Speed (Average)	38 km/h
Travel Distance (Total)	366.4 veh-km/h	Travel Distance (Total)	440.3 veh-km/h	Travel Distance (Total)	574.8 veh-km/h
Travel Time (Total)	9.5 veh-h/h	Travel Time (Total)	11.3 veh-h/h	Travel Time (Total)	15.1 veh-h/h

2018 - Do Min - IP		2028 - Do Min - IP		2048 - Do Min - IP	
Travel Speed (Average)	37.8 km/h	Travel Speed (Average)	38 km/h	Travel Speed (Average)	37.9 km/h
Travel Distance (Total)	281.7 veh-km/h	Travel Distance (Total)	324.2 veh-km/h	Travel Distance (Total)	437.3 veh-km/h
Travel Time (Total)	7.4 veh-h/h	Travel Time (Total)	8.5 veh-h/h	Travel Time (Total)	11.5 veh-h/h

2018 - Do Min - PM		2028 - Do Min - PM		2048 - Do Min - PM	
Travel Speed (Average)	38.1 km/h	Travel Speed (Average)	38 km/h	Travel Speed (Average)	37.2 km/h
Travel Distance (Total)	425.5 veh-km/h	Travel Distance (Total)	447.1 veh-km/h	Travel Distance (Total)	575.3 veh-km/h
Travel Time (Total)	11.2 veh-h/h	Travel Time (Total)	11.8 veh-h/h	Travel Time (Total)	15.5 veh-h/h

Walking and Cycling and PT Service Improvements

2028 - Walking and Cycling and PT Service Improvements - AM		2048 - Walking and Cycling and PT Service Improvements - AM	
Travel Speed (Average)	29.1 km/h	Travel Speed (Average)	28.6 km/h
Travel Distance (Total)	412.9 veh-km/h	Travel Distance (Total)	474 veh-km/h
Travel Time (Total)	14.2 veh-h/h	Travel Time (Total)	16.6 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - IP		2048 - Walking and Cycling and PT Service Improvements - IP	
Travel Speed (Average)	27.3 km/h	Travel Speed (Average)	26.7 km/h
Travel Distance (Total)	319 veh-km/h	Travel Distance (Total)	406.9 veh-km/h
Travel Time (Total)	11.7 veh-h/h	Travel Time (Total)	15.2 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - PM		2048 - Walking and Cycling and PT Service Improvements - PM	
Travel Speed (Average)	27.2 km/h	Travel Speed (Average)	26.7 km/h
Travel Distance (Total)	436.6 veh-km/h	Travel Distance (Total)	490.9 veh-km/h
Travel Time (Total)	16.1 veh-h/h	Travel Time (Total)	18.4 veh-h/h

Preferred Option

2028 - Preferred Option - AM		2048 - Preferred Option - AM	
Travel Speed (Average)	29.1 km/h	Travel Speed (Average)	29 km/h
Travel Distance (Total)	443.5 veh-km/h	Travel Distance (Total)	471.1 veh-km/h
Travel Time (Total)	15.2 veh-h/h	Travel Time (Total)	16.2 veh-h/h

2028 - Preferred Option - IP		2048 - Preferred Option - IP	
Travel Speed (Average)	28 km/h	Travel Speed (Average)	26.7 km/h
Travel Distance (Total)	282.3 veh-km/h	Travel Distance (Total)	422.5 veh-km/h
Travel Time (Total)	10.1 veh-h/h	Travel Time (Total)	15.8 veh-h/h

2028 - Preferred Option - PM		2048 - Preferred Option - PM	
Travel Speed (Average)	27.7 km/h	Travel Speed (Average)	27.5 km/h
Travel Distance (Total)	382.2 veh-km/h	Travel Distance (Total)	503.6 veh-km/h
Travel Time (Total)	13.8 veh-h/h	Travel Time (Total)	18.3 veh-h/h

Figure A1: Decision process for selecting crash analysis methods



NOTES

1. If 3-5 years of crash data is available then use data that is available.
2. Up to 10 years of data can be used at low volume sites (<1500 AADT) or when looking at vulnerable road users (e.g. pedestrian and/or cyclist). Need to check that there has not been fundamental change or high traffic growth.
3. Threshold for intersections/road sections <1km: 5 or more injury crashes or 2 or more serious and fatal crashes at the site in the last 5 years?
Threshold for road sections >1km: 3 or more injury crashes per kilometre or 1 or more serious and fatal crashes per kilometre at the site in the last 5 years?

Motueka Street / Tipahi Street Intersection 2014 - 2018 Crash Data				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
Total	0	1	1	13
Selecting crash analysis methods				
Question				Answer
Is there 3 or more years of reliable crash data?				Yes
Has the amount of crashes exceeded threshold over the last 5 years?				No
Are crash prediction models or crash rate rates available?				Yes
Will the project result in a fundamental change to the site				Yes
Method C for do minimum and method B for project options				

Project option
 Posted speed limit 50 Traffic growth rate 1%
 Road category Time zero 2018

2014
2015
2016
2017
2018
Total

Site specific	
1 Number of crash year history	5
2 Number of injury crashes	2
3 Crash tend adjusment factor	0.86
4 Site specific crash rate (crashes per year), As	0.3

Table A13:

Speed lim
50 and 60
70km/h ar

Crash prediction model for 2018 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	8100
6 Highest or primary AADT, Qmajor	3200
7 Typical crash rate (crashes per year), AT,dm	0.58

1% traffic growth rat

Crash prediction model for 2028 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	8300
6 Highest or primary AADT, Qmajor	3200
7 Typical crash rate (crashes per year), AT,dm	0.59

Crash prediction model for 2048 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	10900
6 Highest or primary AADT, Qmajor	4000
7 Typical crash rate (crashes per year), AT,dm	0.71

Crash prediction model for 2028 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	8000
6 Highest or primary AADT, Qmajor	3100
7 Typical crash rate (crashes per year), AT,dm	0.15

Crash prediction model for 2048 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	9900
6 Highest or primary AADT, Qmajor	3600
7 Typical crash rate (crashes per year), AT,dm	0.17

Crash prediction model for 2028 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.00281
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	8500
6 Highest or primary AADT, Qmajor	2900
7 Typical crash rate (crashes per year), AT,dm	0.39

Crash prediction model for 2048 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.00281
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	9900
6 Highest or primary AADT, Qmajor	3300
7 Typical crash rate (crashes per year), AT,dm	0.42

Fatal injury count	Serious injury count	Minor injury count	Non-injury count
0	0	0	0
0	0	0	2
0	1	0	3
0	0	0	7
0	0	1	1
0	1	1	13

Crash trend adjustments factors

Limit	Traffic growth rate							
	0%	1%	2%	3%	4%	5%	6%	7%
50 km/h	0.83	0.86	0.90	0.93	0.96	0.99	1.03	1.06
60 and above	0.95	0.98	1.02	1.06	1.10	1.14	1.17	1.21

between 50 and 60 km/h

0.86

5 Waimea Road – Franklyn Street Economics

Assumptions	
Discount R	4%

Do Minimum										
	Year	DF	TT	Discounted	VOC	Discounted	CO2	Discounted	Crash Cost	Discounted
	2018		\$ 2,064,706		\$ 1,128,931		\$ 68,705		\$ 237,039	
	2019		\$ 2,130,426		\$ 1,144,961		\$ 69,680		\$ 238,086	
0	2020	1	\$ 2,196,145	\$ 2,196,145	\$ 1,160,991	\$ 1,160,991	\$ 70,656	\$ 70,656	\$ 239,132	\$ 239,132
1	2021	0.961538	\$ 2,261,865	\$ 2,174,870	\$ 1,177,021	\$ 1,131,751	\$ 71,631	\$ 68,876	\$ 240,179	\$ 230,941
2	2022	0.924556	\$ 2,327,585	\$ 2,151,983	\$ 1,193,051	\$ 1,103,043	\$ 72,607	\$ 67,129	\$ 241,225	\$ 223,026
3	2023	0.888996	\$ 2,393,304	\$ 2,127,639	\$ 1,209,081	\$ 1,074,869	\$ 73,583	\$ 65,415	\$ 242,272	\$ 215,379
4	2024	0.854804	\$ 2,459,024	\$ 2,101,984	\$ 1,225,111	\$ 1,047,230	\$ 74,558	\$ 63,733	\$ 243,318	\$ 207,990
5	2025	0.821927	\$ 2,524,744	\$ 2,075,155	\$ 1,241,141	\$ 1,020,128	\$ 75,534	\$ 62,083	\$ 244,365	\$ 200,850
6	2026	0.790315	\$ 2,590,463	\$ 2,047,281	\$ 1,257,171	\$ 993,561	\$ 76,509	\$ 60,466	\$ 245,412	\$ 193,952
7	2027	0.759918	\$ 2,656,183	\$ 2,018,481	\$ 1,273,201	\$ 967,528	\$ 77,485	\$ 58,882	\$ 246,458	\$ 187,288
8	2028	0.73069	\$ 2,721,903	\$ 1,988,868	\$ 1,289,231	\$ 942,029	\$ 78,460	\$ 57,330	\$ 247,505	\$ 180,849
9	2029	0.702587	\$ 2,775,146	\$ 1,949,781	\$ 1,301,441	\$ 914,375	\$ 79,203	\$ 55,647	\$ 249,382	\$ 175,213
10	2030	0.675564	\$ 2,828,389	\$ 1,910,758	\$ 1,313,650	\$ 887,455	\$ 79,946	\$ 54,009	\$ 251,259	\$ 169,742
11	2031	0.649581	\$ 2,881,632	\$ 1,871,853	\$ 1,325,859	\$ 861,253	\$ 80,689	\$ 52,414	\$ 253,137	\$ 164,433
12	2032	0.624597	\$ 2,934,875	\$ 1,833,115	\$ 1,338,068	\$ 835,753	\$ 81,432	\$ 50,862	\$ 255,014	\$ 159,281
13	2033	0.600574	\$ 2,988,119	\$ 1,794,587	\$ 1,350,277	\$ 810,942	\$ 82,176	\$ 49,352	\$ 256,892	\$ 154,282
14	2034	0.577475	\$ 3,041,362	\$ 1,756,311	\$ 1,362,487	\$ 786,802	\$ 82,919	\$ 47,883	\$ 258,769	\$ 149,433
15	2035	0.555265	\$ 3,094,605	\$ 1,718,324	\$ 1,374,696	\$ 763,320	\$ 83,662	\$ 46,454	\$ 260,646	\$ 144,728
16	2036	0.533908	\$ 3,147,848	\$ 1,680,662	\$ 1,386,905	\$ 740,480	\$ 84,405	\$ 45,064	\$ 262,524	\$ 140,164
17	2037	0.513373	\$ 3,201,092	\$ 1,643,355	\$ 1,399,114	\$ 718,268	\$ 85,148	\$ 43,713	\$ 264,401	\$ 135,377
18	2038	0.493628	\$ 3,254,335	\$ 1,606,431	\$ 1,411,323	\$ 696,669	\$ 85,891	\$ 42,398	\$ 266,279	\$ 131,443
19	2039	0.474642	\$ 3,307,578	\$ 1,569,917	\$ 1,423,533	\$ 675,669	\$ 86,634	\$ 41,120	\$ 268,156	\$ 127,278
20	2040	0.456387	\$ 3,360,821	\$ 1,533,835	\$ 1,435,742	\$ 655,254	\$ 87,377	\$ 39,878	\$ 270,033	\$ 123,240
21	2041	0.438834	\$ 3,414,064	\$ 1,498,206	\$ 1,447,951	\$ 635,410	\$ 88,120	\$ 38,670	\$ 271,911	\$ 119,324
22	2042	0.421955	\$ 3,467,308	\$ 1,463,049	\$ 1,460,160	\$ 616,122	\$ 88,863	\$ 37,496	\$ 273,788	\$ 115,526
23	2043	0.405726	\$ 3,520,551	\$ 1,428,380	\$ 1,472,369	\$ 597,379	\$ 89,606	\$ 36,355	\$ 275,666	\$ 111,845
24	2044	0.390121	\$ 3,573,794	\$ 1,394,214	\$ 1,484,579	\$ 579,166	\$ 90,349	\$ 35,247	\$ 277,543	\$ 108,276
25	2045	0.375117	\$ 3,627,037	\$ 1,360,563	\$ 1,496,788	\$ 561,470	\$ 91,092	\$ 34,170	\$ 279,421	\$ 104,815
26	2046	0.360689	\$ 3,680,280	\$ 1,327,437	\$ 1,508,997	\$ 544,279	\$ 91,835	\$ 33,124	\$ 281,298	\$ 101,461
27	2047	0.346817	\$ 3,733,524	\$ 1,294,848	\$ 1,521,206	\$ 527,580	\$ 92,578	\$ 32,108	\$ 283,175	\$ 98,210
28	2048	0.333477	\$ 3,786,767	\$ 1,262,801	\$ 1,533,416	\$ 511,360	\$ 93,321	\$ 31,120	\$ 285,053	\$ 95,059
29	2049	0.320651	\$ 3,786,767	\$ 1,214,232	\$ 1,533,416	\$ 491,692	\$ 93,321	\$ 29,924	\$ 285,053	\$ 91,403
30	2050	0.308319	\$ 3,786,767	\$ 1,167,531	\$ 1,533,416	\$ 472,781	\$ 93,321	\$ 28,773	\$ 285,053	\$ 87,887
31	2051	0.29646	\$ 3,786,767	\$ 1,122,626	\$ 1,533,416	\$ 454,597	\$ 93,321	\$ 27,666	\$ 285,053	\$ 84,507
32	2052	0.285058	\$ 3,786,767	\$ 1,079,448	\$ 1,533,416	\$ 437,112	\$ 93,321	\$ 26,602	\$ 285,053	\$ 81,257
33	2053	0.274094	\$ 3,786,767	\$ 1,037,931	\$ 1,533,416	\$ 420,300	\$ 93,321	\$ 25,579	\$ 285,053	\$ 78,131
34	2054	0.263552	\$ 3,786,767	\$ 998,010	\$ 1,533,416	\$ 404,135	\$ 93,321	\$ 24,595	\$ 285,053	\$ 75,126
35	2055	0.253415	\$ 3,786,767	\$ 959,625	\$ 1,533,416	\$ 388,591	\$ 93,321	\$ 23,649	\$ 285,053	\$ 72,237
36	2056	0.243669	\$ 3,786,767	\$ 922,717	\$ 1,533,416	\$ 373,645	\$ 93,321	\$ 22,739	\$ 285,053	\$ 69,458
37	2057	0.234297	\$ 3,786,767	\$ 887,228	\$ 1,533,416	\$ 359,274	\$ 93,321	\$ 21,865	\$ 285,053	\$ 66,787
38	2058	0.225285	\$ 3,786,767	\$ 853,103	\$ 1,533,416	\$ 345,456	\$ 93,321	\$ 21,024	\$ 285,053	\$ 64,218
39	2059	0.216621	\$ 3,786,767	\$ 820,292	\$ 1,533,416	\$ 332,169	\$ 93,321	\$ 20,215	\$ 285,053	\$ 61,748
40	2060	0.208289	\$ 3,786,767	\$ 788,742	\$ 1,533,416	\$ 319,394	\$ 93,321	\$ 19,438	\$ 285,053	\$ 59,373
	Total	20.7928	\$ 137,386,676	\$ 62,632,317	\$ 60,049,438	\$ 28,159,279	\$ 3,654,503	\$ 1,713,724	\$ 11,429,971	\$ 5,401,028

TT	Discounted	Step Change
\$ 2,064,706		
\$ 2,115,408		
\$ 2,166,109	\$ 2,166,109	\$ 2,196,145
\$ 2,216,810	\$ 2,131,548	\$ 2,174,870
\$ 2,267,512	\$ 2,096,442	\$ 2,151,983
\$ 2,318,213	\$ 2,060,883	\$ 2,127,639
\$ 2,368,915	\$ 2,024,958	\$ 2,101,984
\$ 2,419,616	\$ 1,988,748	\$ 1,988,748
\$ 2,470,318	\$ 1,952,328	\$ 1,952,328
\$ 2,521,019	\$ 1,915,767	\$ 1,915,767
\$ 2,571,720	\$ 1,879,131	\$ 1,879,131
\$ 2,607,151	\$ 1,831,750	\$ 1,831,750
\$ 2,642,581	\$ 1,785,233	\$ 1,785,233
\$ 2,678,011	\$ 1,739,585	\$ 1,739,585
\$ 2,713,442	\$ 1,694,808	\$ 1,694,808
\$ 2,748,872	\$ 1,650,901	\$ 1,650,901
\$ 2,784,302	\$ 1,607,865	\$ 1,607,865
\$ 2,819,733	\$ 1,565,697	\$ 1,565,697
\$ 2,855,163	\$ 1,524,395	\$ 1,524,395
\$ 2,890,593	\$ 1,483,953	\$ 1,483,953
\$ 2,926,023	\$ 1,444,367	\$ 1,444,367
\$ 2,961,454	\$ 1,405,632	\$ 1,405,632
\$ 2,996,884	\$ 1,367,739	\$ 1,367,739
\$ 3,032,314	\$ 1,330,681	\$ 1,330,681
\$ 3,067,745	\$ 1,294,451	\$ 1,294,451
\$ 3,103,175	\$ 1,259,040	\$ 1,259,040
\$ 3,138,605	\$ 1,224,437	\$ 1,224,437
\$ 3,174,036	\$ 1,190,634	\$ 1,190,634
\$ 3,209,466	\$ 1,157,620	\$ 1,157,620
\$ 3,244,896	\$ 1,125,384	\$ 1,125,384
\$ 3,280,326	\$ 1,093,915	\$ 1,093,915
\$ 3,280,326	\$ 1,051,841	\$ 1,051,841
\$ 3,280,326	\$ 1,011,386	\$ 1,011,386
\$ 3,280,326	\$ 972,486	\$ 972,486
\$ 3,280,326	\$ 935,083	\$ 935,083
\$ 3,280,326	\$ 899,118	\$ 899,118
\$ 3,280,326	\$ 864,537	\$ 864,537
\$ 3,280,326	\$ 831,285	\$ 831,285
\$ 3,280,326	\$ 799,313	\$ 799,313
\$ 3,280,326	\$ 768,570	\$ 768,570
\$ 3,280,326	\$ 739,010	\$ 739,010
\$ 3,280,326	\$ 710,586	\$ 710,586
\$ 3,280,326	\$ 683,256	\$ 683,256
\$ 123,739,035	\$ 57,260,475	\$ 57,533,156

Update Factor	1.540	1.100	1.000	1.000
NPV	\$ 96,453,768	\$ 30,975,207	\$ 1,713,724	\$ 5,401,028

Update Factor	1.540
NPV	\$ 88,601,060

Walking and Cycling and PT Service Improvements									
VOC	Discounted	Step Change	CO2	Discounted	Step Change	Crash Cost	Discounted	Step Change	Notes
\$ 1,128,931			\$ 68,705			\$ 237,039			
\$ 1,142,351			\$ 69,521			\$ 237,648			
\$ 1,155,772	\$ 1,155,772	\$ 1,160,991	\$ 70,338	\$ 70,338	\$ 70,656	\$ 238,256	\$ 238,256	\$ 239,132	
\$ 1,169,192	\$ 1,124,223	\$ 1,131,751	\$ 71,155	\$ 68,418	\$ 68,876	\$ 238,865	\$ 229,678	\$ 230,941	
\$ 1,182,613	\$ 1,093,392	\$ 1,103,043	\$ 71,972	\$ 66,542	\$ 67,129	\$ 239,473	\$ 221,406	\$ 223,026	Project Construction
\$ 1,196,033	\$ 1,063,269	\$ 1,074,869	\$ 72,788	\$ 64,709	\$ 65,415	\$ 240,082	\$ 213,432	\$ 215,379	Project Construction
\$ 1,209,453	\$ 1,033,846	\$ 1,047,230	\$ 73,605	\$ 62,918	\$ 63,733	\$ 240,690	\$ 205,743	\$ 207,990	Project Construction
\$ 1,222,874	\$ 1,005,113	\$ 1,005,113	\$ 74,422	\$ 61,169	\$ 61,169	\$ 241,299	\$ 198,330	\$ 198,330	
\$ 1,236,294	\$ 977,061	\$ 977,061	\$ 75,239	\$ 59,462	\$ 59,462	\$ 241,907	\$ 191,183	\$ 191,183	
\$ 1,249,715	\$ 949,681	\$ 949,681	\$ 76,055	\$ 57,796	\$ 57,796	\$ 242,516	\$ 184,292	\$ 184,292	
\$ 1,263,135	\$ 922,961	\$ 922,961	\$ 76,872	\$ 56,170	\$ 56,170	\$ 243,124	\$ 177,648	\$ 177,648	
\$ 1,274,915	\$ 895,738	\$ 895,738	\$ 77,589	\$ 54,513	\$ 54,513	\$ 245,079	\$ 172,189	\$ 172,189	
\$ 1,286,694	\$ 869,244	\$ 869,244	\$ 78,306	\$ 52,901	\$ 52,901	\$ 247,034	\$ 166,887	\$ 166,887	
\$ 1,298,473	\$ 843,463	\$ 843,463	\$ 79,023	\$ 51,332	\$ 51,332	\$ 248,989	\$ 161,739	\$ 161,739	
\$ 1,310,252	\$ 818,380	\$ 818,380	\$ 79,740	\$ 49,805	\$ 49,805	\$ 250,944	\$ 156,739	\$ 156,739	
\$ 1,322,032	\$ 793,978	\$ 793,978	\$ 80,457	\$ 48,320	\$ 48,320	\$ 252,899	\$ 151,885	\$ 151,885	
\$ 1,333,811	\$ 770,243	\$ 770,243	\$ 81,173	\$ 46,876	\$ 46,876	\$ 254,855	\$ 147,172	\$ 147,172	
\$ 1,345,590	\$ 747,158	\$ 747,158	\$ 81,890	\$ 45,471	\$ 45,471	\$ 256,810	\$ 142,597	\$ 142,597	
\$ 1,357,369	\$ 724,711	\$ 724,711	\$ 82,607	\$ 44,105	\$ 44,105	\$ 258,765	\$ 138,157	\$ 138,157	
\$ 1,369,149	\$ 702,884	\$ 702,884	\$ 83,324	\$ 42,776	\$ 42,776	\$ 260,720	\$ 133,847	\$ 133,847	
\$ 1,380,928	\$ 681,665	\$ 681,665	\$ 84,041	\$ 41,485	\$ 41,485	\$ 262,675	\$ 129,664	\$ 129,664	
\$ 1,392,707	\$ 661,038	\$ 661,038	\$ 84,758	\$ 40,230	\$ 40,230	\$ 264,630	\$ 125,605	\$ 125,605	
\$ 1,404,486	\$ 640,989	\$ 640,989	\$ 85,475	\$ 39,009	\$ 39,009	\$ 266,585	\$ 121,666	\$ 121,666	
\$ 1,416,266	\$ 621,505	\$ 621,505	\$ 86,191	\$ 37,824	\$ 37,824	\$ 268,540	\$ 117,844	\$ 117,844	
\$ 1,428,045	\$ 602,571	\$ 602,571	\$ 86,908	\$ 36,671	\$ 36,671	\$ 270,495	\$ 114,137	\$ 114,137	
\$ 1,439,824	\$ 584,175	\$ 584,175	\$ 87,625	\$ 35,552	\$ 35,552	\$ 272,450	\$ 110,540	\$ 110,540	
\$ 1,451,603	\$ 566,302	\$ 566,302	\$ 88,342	\$ 34,464	\$ 34,464	\$ 274,405	\$ 107,051	\$ 107,051	
\$ 1,463,383	\$ 548,939	\$ 548,939	\$ 89,059	\$ 33,407	\$ 33,407	\$ 276,360	\$ 103,667	\$ 103,667	
\$ 1,475,162	\$ 532,075	\$ 532,075	\$ 89,776	\$ 32,381	\$ 32,381	\$ 278,315	\$ 100,385	\$ 100,385	
\$ 1,486,941	\$ 515,696	\$ 515,696	\$ 90,493	\$ 31,384	\$ 31,384	\$ 280,270	\$ 97,202	\$ 97,202	
\$ 1,498,720	\$ 499,790	\$ 499,790	\$ 91,209	\$ 30,416	\$ 30,416	\$ 282,226	\$ 94,116	\$ 94,116	
\$ 1,498,720	\$ 480,567	\$ 480,567	\$ 91,209	\$ 29,246	\$ 29,246	\$ 282,226	\$ 90,496	\$ 90,496	
\$ 1,498,720	\$ 462,084	\$ 462,084	\$ 91,209	\$ 28,122	\$ 28,122	\$ 282,226	\$ 87,015	\$ 87,015	
\$ 1,498,720	\$ 444,311	\$ 444,311	\$ 91,209	\$ 27,040	\$ 27,040	\$ 282,226	\$ 83,669	\$ 83,669	
\$ 1,498,720	\$ 427,222	\$ 427,222	\$ 91,209	\$ 26,000	\$ 26,000	\$ 282,226	\$ 80,451	\$ 80,451	
\$ 1,498,720	\$ 410,791	\$ 410,791	\$ 91,209	\$ 25,000	\$ 25,000	\$ 282,226	\$ 77,356	\$ 77,356	
\$ 1,498,720	\$ 394,991	\$ 394,991	\$ 91,209	\$ 24,038	\$ 24,038	\$ 282,226	\$ 74,381	\$ 74,381	
\$ 1,498,720	\$ 379,799	\$ 379,799	\$ 91,209	\$ 23,114	\$ 23,114	\$ 282,226	\$ 71,520	\$ 71,520	
\$ 1,498,720	\$ 365,191	\$ 365,191	\$ 91,209	\$ 22,225	\$ 22,225	\$ 282,226	\$ 68,770	\$ 68,770	
\$ 1,498,720	\$ 351,145	\$ 351,145	\$ 91,209	\$ 21,370	\$ 21,370	\$ 282,226	\$ 66,125	\$ 66,125	
\$ 1,498,720	\$ 337,640	\$ 337,640	\$ 91,209	\$ 20,548	\$ 20,548	\$ 282,226	\$ 63,581	\$ 63,581	
\$ 1,498,720	\$ 324,654	\$ 324,654	\$ 91,209	\$ 19,758	\$ 19,758	\$ 282,226	\$ 61,136	\$ 61,136	
\$ 1,498,720	\$ 312,167	\$ 312,167	\$ 91,209	\$ 18,998	\$ 18,998	\$ 282,226	\$ 58,784	\$ 58,784	
\$ 58,877,358	\$ 27,636,422	\$ 27,683,803	\$ 3,583,172	\$ 1,681,904	\$ 1,684,788	\$ 11,300,651	\$ 5,336,342	\$ 5,344,295	

		1.100			1.000			1.000	
		\$ 30,452,184			\$ 1,684,788			\$ 5,344,295	

TT	Discounted	Step Change
\$ 2,064,706		
\$ 2,141,124		
\$ 2,217,541	\$ 2,217,541	\$ 2,196,145
\$ 2,293,959	\$ 2,205,730	\$ 2,174,870
\$ 2,370,377	\$ 2,191,547	\$ 2,151,983
\$ 2,446,795	\$ 2,175,191	\$ 2,127,639
\$ 2,523,212	\$ 2,156,852	\$ 2,101,984
\$ 2,599,630	\$ 2,136,706	\$ 1,988,748
\$ 2,676,048	\$ 2,114,919	\$ 1,952,328
\$ 2,752,465	\$ 2,091,647	\$ 1,915,767
\$ 2,828,883	\$ 2,067,037	\$ 1,879,131
\$ 2,860,247	\$ 2,009,572	\$ 1,831,750
\$ 2,891,612	\$ 1,953,469	\$ 1,785,233
\$ 2,922,976	\$ 1,898,710	\$ 1,739,585
\$ 2,954,341	\$ 1,845,272	\$ 1,694,808
\$ 2,985,705	\$ 1,793,137	\$ 1,650,901
\$ 3,017,069	\$ 1,742,282	\$ 1,742,282
\$ 3,048,434	\$ 1,692,687	\$ 1,692,687
\$ 3,079,798	\$ 1,644,330	\$ 1,644,330
\$ 3,111,163	\$ 1,597,188	\$ 1,597,188
\$ 3,142,527	\$ 1,551,240	\$ 1,551,240
\$ 3,173,892	\$ 1,506,464	\$ 1,506,464
\$ 3,205,256	\$ 1,462,837	\$ 1,462,837
\$ 3,236,620	\$ 1,420,338	\$ 1,420,338
\$ 3,267,985	\$ 1,378,944	\$ 1,378,944
\$ 3,299,349	\$ 1,338,633	\$ 1,338,633
\$ 3,330,714	\$ 1,299,383	\$ 1,299,383
\$ 3,362,078	\$ 1,261,172	\$ 1,261,172
\$ 3,393,443	\$ 1,223,978	\$ 1,223,978
\$ 3,424,807	\$ 1,187,780	\$ 1,187,780
\$ 3,456,171	\$ 1,152,555	\$ 1,152,555
\$ 3,456,171	\$ 1,108,226	\$ 1,108,226
\$ 3,456,171	\$ 1,065,602	\$ 1,065,602
\$ 3,456,171	\$ 1,024,617	\$ 1,024,617
\$ 3,456,171	\$ 985,209	\$ 985,209
\$ 3,456,171	\$ 947,316	\$ 947,316
\$ 3,456,171	\$ 910,881	\$ 910,881
\$ 3,456,171	\$ 875,847	\$ 875,847
\$ 3,456,171	\$ 842,161	\$ 842,161
\$ 3,456,171	\$ 809,770	\$ 809,770
\$ 3,456,171	\$ 778,625	\$ 778,625
\$ 3,456,171	\$ 748,678	\$ 748,678
\$ 3,456,171	\$ 719,883	\$ 719,883
\$ 131,552,985	\$ 61,133,959	\$ 59,467,499

Update Factor		1.540
NPV		\$ 91,579,949

Do Minimum Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1334.3	72.2	1.03
2018 IP	1147.1	27.3	
2018 PM	1459.4	58.8	
2028 Do Min AM	1355.5	67.2	1.08
2028 Do Min IP	1348.5	43.6	
2028 Do Min PM	1628.9	64.8	
2048 Do Min AM	1392.7	59.4	1.24
2048 Do Min IP	1646.5	63.9	
2048 Do Min PM	1929.2	106.9	

Walking and Cycling and PT Service Improvements Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1334.3	72.2	1.03
2018 IP	1147.1	27.3	
2018 PM	1459.4	58.8	
2028 Package 2 AM	1352.7	44.2	1.06
2028 Package 2 IP	1317.5	42.6	
2028 Package 2 PM	1591.1	73	
2048 Package 2 AM	1367.1	44.2	1.23
2048 Package 2 IP	1612.9	54	
2048 Package 2 PM	1860.1	107.1	

Preferred Option Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1334.3	72.2	1.03
2018 IP	1147.1	27.3	
2018 PM	1459.4	58.8	
2028 Package 2 + 3 AM	1398.8	64.7	0.61
2028 Package 2 + 3 IP	1271.9	44.9	
2028 Package 2 + 3 PM	1554.1	74.7	
2048 Package 2 + 3 AM	1467.6	63.6	0.69
2048 Package 2 + 3 IP	1570.1	58	
2048 Package 2 + 3 PM	1685.7	89.9	

Do Minimum				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,064,706	\$ 1,128,931	\$ 68,705	\$ 237,039	
2028				
\$ 2,721,903	\$ 1,289,231	\$ 78,460	\$ 247,505	
2048				
\$ 3,786,767	\$ 1,533,416	\$ 93,321	\$ 285,053	

Walking and Cycling and PT Service Improvements				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,064,706	\$ 1,128,931	\$ 68,705	\$ 237,039	
2028				
\$ 2,571,720	\$ 1,263,135	\$ 76,872	\$ 243,124	
2048				
\$ 3,280,326	\$ 1,498,720	\$ 91,209	\$ 282,226	

Preferred Option				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,064,706	\$ 1,128,931	\$ 68,705	\$ 237,039	
2028				
\$ 2,828,883	\$ 1,233,451	\$ 75,066	\$ 139,630	
2048				
\$ 3,456,171	\$ 1,460,435	\$ 88,879	\$ 159,036	

TT and VOC		
Item	Value	Source and Assumptions
TT \$/hr	16.27	Table 17 Urban Arterial all periods
VOC cents/km	27.6	Table A72 50kph and 0% gradient
Generalised Day	245	
Weekdays	245	
Other days	120	
Assume 0% traffic on other days	0	

Peak to AADT Factor	
Peak	Factor
AM	1.87
IP	10
PM	1.87

CO2		
Item	Value	Source and Assumptions
LV CO2	0.0009	MBCM
HCV CO2	0.0016	MBCM
Generalised CO2	0.000928	
CO2 value/ton	\$65.58	MBCM
LV%	96%	Average observation from SATURN model
HCV%	4%	Average observation from SATURN model

Crash Cost		
Item	Value	Source and Assumptions
For 50km/h, Priority X	\$230,000	Crash Estimation Compendium
For 50km/h, Signalised X	\$220,000	Crash Estimation Compendium

Projects
Franklyn Road / Waimea Road Signalised Intersection + PT Priority

Table A72: LCV VOC by speed and gradient (cents/km – July 2015)

Speed (km/h)	Gradient in percent (both directions)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
10	44.2	44.2	44.3	44.3	44.5	44.7	44.9	45.2	45.6	46.1	46.7	47.3	48.1
15	39.2	39.2	39.4	39.5	39.8	40.0	40.4	40.8	41.4	42.0	42.7	43.5	44.4
20	35.5	35.8	35.7	35.9	36.2	36.6	37.0	37.5	38.1	38.8	39.6	40.5	41.5
25	32.9	33.0	33.1	33.3	33.6	34.0	34.5	35.0	35.7	36.4	37.3	38.3	39.4
30	30.9	31.0	31.2	31.4	31.8	32.2	32.7	33.2	33.9	34.7	35.7	36.7	37.8
35	29.6	29.7	29.8	30.1	30.4	30.8	31.4	32.0	32.7	33.5	34.5	35.6	36.8
40	28.8	28.7	28.9	29.2	29.5	29.9	30.5	31.1	31.8	32.7	33.7	34.8	36.0
45	28.0	28.1	28.3	28.5	28.9	29.3	29.9	30.5	31.3	32.2	33.2	34.3	35.6
50	27.5	27.7	27.9	28.2	28.5	29.0	29.5	30.2	31.0	31.9	32.9	34.1	35.4
55	27.5	27.6	27.8	28.0	28.4	28.8	29.4	30.1	30.9	31.8	32.8	34.0	35.3
60	27.5	27.6	27.8	28.0	28.4	28.9	29.4	30.1	30.9	31.8	32.9	34.1	35.5
65	27.7	27.8	27.9	28.2	28.6	29.0	29.6	30.3	31.1	32.0	33.1	34.3	35.7
70	28.0	28.0	28.2	28.5	28.8	29.3	29.9	30.6	31.4	32.3	33.4	34.7	36.0
75	28.2	28.4	28.6	28.8	29.2	29.7	30.2	30.9	31.8	32.7	33.8	35.1	36.4
80	28.8	28.9	29.0	29.3	29.6	30.1	30.7	31.4	32.2	33.2	34.3	35.5	36.9
85	29.3	29.4	29.5	29.8	30.1	30.6	31.2	31.9	32.7	33.7	34.8	36.1	37.5
90	29.9	30.0	30.1	30.4	30.7	31.2	31.8	32.5	33.3	34.3	35.4	36.7	38.1
95	30.5	30.6	30.7	31.0	31.3	31.8	32.4	33.1	34.0	34.9	36.1	37.3	38.8
100	31.2	31.3	31.4	31.7	32.0	32.5	33.1	33.8	34.6	35.6	36.7	38.0	39.5
105	31.8	32.0	32.1	32.4	32.7	33.2	33.8	34.5	35.3	36.3	37.5	38.8	40.2
110	32.7	32.7	32.9	33.1	33.4	33.9	34.5	35.2	36.1	37.1	38.2	39.5	41.0
115	33.5	33.5	33.6	33.9	34.2	34.7	35.3	36.0	36.8	37.8	39.0	40.3	41.7
120	34.3	34.3	34.4	34.7	35.0	35.5	36.1	36.8	37.6	38.6	39.8	41.1	42.5

Road links

For road links, vehicle operating costs (VOC, 2015 base date) are calculated by summing running costs and roughness costs. The fuel cost component of running costs is approximately 50%, while for roughness costs the fuel cost component is negligible.

The following formulae can be used to determine CO₂ emissions:

- light vehicle CO₂ (in tonnes) = VOC(\$)² × 0.0009
- heavy vehicle CO₂ (in tonnes) = VOC(\$)² × 0.0016.

The value of NZ\$65.58 per tonne of CO₂ (as at June 2016) should be used for project evaluation. This is based on the [Austroads \(2012\)](#) value.

Table A28: Cost per reported injury crash (\$000 2015)

Crash site/type	Speed limit area (\$000 2015)			
	50km/h	70km/h	100km/h near rural	100km/h remote rural
All other sites	220	340	580	905
Mid-block crashes	275	435	585	850
Intersection crashes:				
Uncontrolled T	195	375	530	820
Roundabout	210	340	545	645
Priority T & Y	240	295	565	880
Priority X	230	305	575	890
Signalised T, Y	235	280	545	855
Signalised X	220	265	620	960

Project Expected Estimate	95th percentile Project Estimate	Construction Period	Separate Spreadsheets
\$ 1,578,857	\$ 1,921,823	2022 - end of 2024	Cost_Franklyn_Waimea signalised intersection DBE May 2021.xls

Do Minimum

2018 - Do Min - AM		2028 - Do Min - AM		2048 - Do Min - AM	
Travel Speed (Average)	18.5 km/h	Travel Speed (Average)	20.2 km/h	Travel Speed (Average)	23.4 km/h
Travel Distance (Total)	1334.3 veh-km/h	Travel Distance (Total)	1355.5 veh-km/h	Travel Distance (Total)	1392.7 veh-km/h
Travel Time (Total)	72.2 veh-h/h	Travel Time (Total)	67.2 veh-h/h	Travel Time (Total)	59.4 veh-h/h

2018 - Do Min - IP		2028 - Do Min - IP		2048 - Do Min - IP	
Travel Speed (Average)	42 km/h	Travel Speed (Average)	31 km/h	Travel Speed (Average)	25.8 km/h
Travel Distance (Total)	1147.1 veh-km/h	Travel Distance (Total)	1348.5 veh-km/h	Travel Distance (Total)	1646.5 veh-km/h
Travel Time (Total)	27.3 veh-h/h	Travel Time (Total)	43.6 veh-h/h	Travel Time (Total)	63.9 veh-h/h

2018 - Do Min - PM		2028 - Do Min - PM		2048 - Do Min - PM	
Travel Speed (Average)	24.8 km/h	Travel Speed (Average)	25.1 km/h	Travel Speed (Average)	18 km/h
Travel Distance (Total)	1459.4 veh-km/h	Travel Distance (Total)	1629.9 veh-km/h	Travel Distance (Total)	1929.2 veh-km/h
Travel Time (Total)	58.8 veh-h/h	Travel Time (Total)	64.8 veh-h/h	Travel Time (Total)	106.9 veh-h/h

Walking and Cycling and PT Service Improvements

2028 - Walking and Cycling and PT Service Improvements - AM		2048 - Walking and Cycling and PT Service Improvements - AM	
Travel Speed (Average)	30.6 km/h	Travel Speed (Average)	30.9 km/h
Travel Distance (Total)	1352.7 veh-km/h	Travel Distance (Total)	1367.1 veh-km/h
Travel Time (Total)	44.2 veh-h/h	Travel Time (Total)	44.2 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - IP		2048 - Walking and Cycling and PT Service Improvements - IP	
Travel Speed (Average)	30.9 km/h	Travel Speed (Average)	29.9 km/h
Travel Distance (Total)	1317.5 veh-km/h	Travel Distance (Total)	1612.9 veh-km/h
Travel Time (Total)	42.6 veh-h/h	Travel Time (Total)	54 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - PM		2048 - Walking and Cycling and PT Service Improvements - PM	
Travel Speed (Average)	21.8 km/h	Travel Speed (Average)	17.4 km/h
Travel Distance (Total)	1591.1 veh-km/h	Travel Distance (Total)	1860.1 veh-km/h
Travel Time (Total)	73 veh-h/h	Travel Time (Total)	107.1 veh-h/h

Preferred Option

2028 - Preferred Option - AM		2048 - Preferred Option - AM	
Travel Speed (Average)	21.6 km/h	Travel Speed (Average)	23.1 km/h
Travel Distance (Total)	1398.8 veh-km/h	Travel Distance (Total)	1467.6 veh-km/h
Travel Time (Total)	64.7 veh-h/h	Travel Time (Total)	63.6 veh-h/h

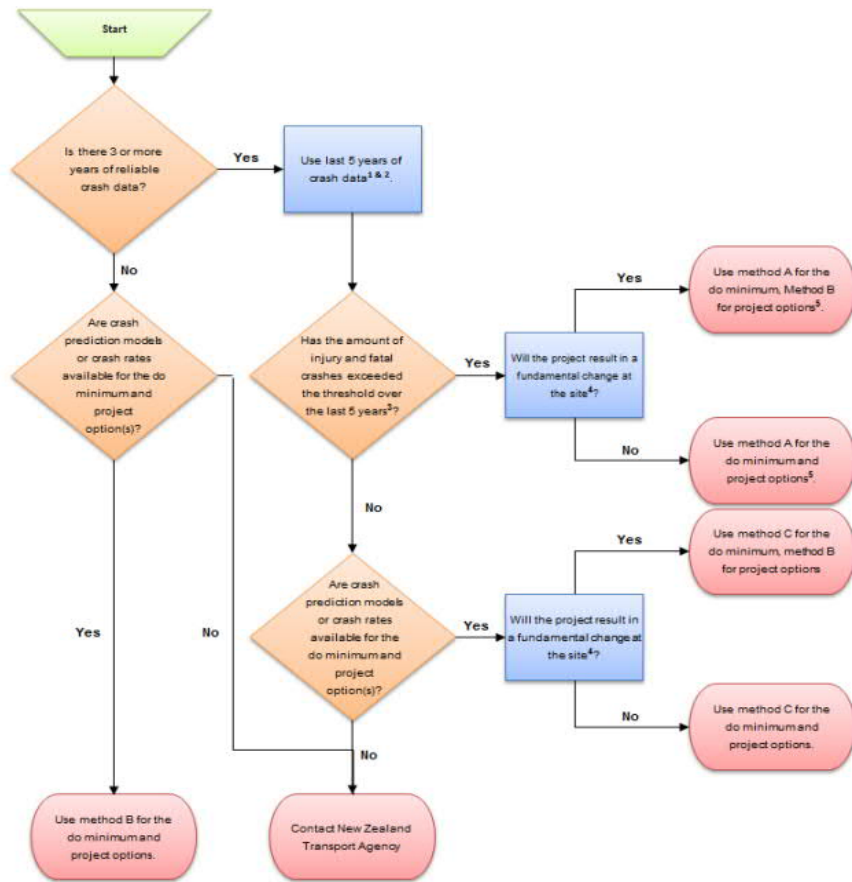
2028 - Preferred Option - IP		2048 - Preferred Option - IP	
Travel Speed (Average)	28.3 km/h	Travel Speed (Average)	27.1 km/h
Travel Distance (Total)	1271.9 veh-km/h	Travel Distance (Total)	1570.1 veh-km/h
Travel Time (Total)	44.9 veh-h/h	Travel Time (Total)	58 veh-h/h

2028 - Preferred Option - PM		2048 - Preferred Option - PM	
Travel Speed (Average)	20.8 km/h	Travel Speed (Average)	18.8 km/h
Travel Distance (Total)	1554.1 veh-km/h	Travel Distance (Total)	1685.7 veh-km/h
Travel Time (Total)	74.7 veh-h/h	Travel Time (Total)	89.9 veh-h/h

Total NPV Costs					
	Travel Time Cost	Vehicle Operation Cost	CO2 Cost	Crash Cost	Project Cost
Do Minimum	\$ 96,454,000	\$ 30,975,000	\$ 1,714,000	\$ 5,401,000	
Preferred Option	\$ 91,580,000	\$ 30,064,000	\$ 1,663,000	\$ 4,187,000	\$ 1,404,000

Total NPV Benefits						
	Travel Time Benefit	Vehicle Operation Benefit	CO2 Benefit	Crash Benefit	Project Cost	BCR
Preferred Option	\$ 4,874,000	\$ 911,000	\$ 51,000	\$ 1,214,000	\$ 1,404,000	5.0

Figure A1: Decision process for selecting crash analysis methods



NOTES

1. If 3-5 years of crash data is available then use data that is available.
2. Up to 10 years of data can be used at low volume sites (<1500 AADT) or when looking at vulnerable road users (e.g. pedestrian and/or cyclist). Need to check that there has not been fundamental change or high traffic growth.
3. Threshold for intersections/road sections <1km: 5 or more injury crashes or 2 or more serious and fatal crashes at the site in the last 5 years?
Threshold for road sections >1km: 3 or more injury crashes per kilometre or 1 or more serious and fatal crashes per kilometre at the site in the last 5 years?

Waimea Road / Franklyn Street Intersection 2014 - 2018 Crash Data				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
Total	0	0	2	5
Selecting crash analysis methods				
Question				Answer
Is there 3 or more years of reliable crash data?				Yes
Has the amount of crashes exceeded threshold over the last 5 years?				No
Are crash prediction models or crash rate rates available?				Yes
Will the project result in a fundamental change to the site				Yes
Method C for do minimum and method B for project options				

Project option
 Posted speed limit 50 Traffic growth rate 1%
 Road category Time zero 2018

Site specific	
1 Number of crash year history	5
2 Number of injury crashes	2
3 Crash tend adjustment factor	0.86
4 Site specific crash rate (crashes per year), As	0.3

Crash prediction model for 2018 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	22200
6 Highest or primary AADT, Qmajor	4300
7 Typical crash rate (crashes per year), AT,dm	1.03

Crash prediction model for 2028 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	26300
6 Highest or primary AADT, Qmajor	3500
7 Typical crash rate (crashes per year), AT,dm	1.08

Crash prediction model for 2048 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	31000
6 Highest or primary AADT, Qmajor	4600
7 Typical crash rate (crashes per year), AT,dm	1.24

Crash prediction model for 2028 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	25700
6 Highest or primary AADT, Qmajor	3400
7 Typical crash rate (crashes per year), AT,dm	1.06

Crash prediction model for 2048 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.00108
3 Parameter b1	0.21
4 Parameter b2	0.51
5 Lowest or sideroad AADT, Qminor	30400
6 Highest or primary AADT, Qmajor	4600
7 Typical crash rate (crashes per year), AT,dm	1.23

Crash prediction model for 2028 Package Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.00281
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	22900
6 Highest or primary AADT, Qmajor	5600
7 Typical crash rate (crashes per year), AT,dm	0.61

Crash prediction model for 2048 Package Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.00281
3 Parameter b1	0.46
4 Parameter b2	0.14
5 Lowest or sideroad AADT, Qminor	26600
6 Highest or primary AADT, Qmajor	7100
7 Typical crash rate (crashes per year), AT,dm	0.69

	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
2014	0	0	0	2
2015	0	0	1	1
2016	0	0	0	2
2017	0	0	1	1
2018	0	0	0	3
Total	0	0	2	9

Table A13: Crash trend adjustments factors

Speed limit	Traffic growth rate							
	0%	1%	2%	3%	4%	5%	6%	7%
50 and 60km/h	0.83	0.86	0.90	0.93	0.96	0.99	1.03	1.06
70km/h and above	0.95	0.98	1.02	1.06	1.10	1.14	1.17	1.21

1% traffic growth rate between 50 and 60 km/h

0.86

6 Tahunanui Drive – Maire St – Parkers Road Economics

Total NPV Costs					
	Travel Time Cost	Vehicle Operation Cost	CO2 Cost	Crash Cost	Project Cost
Do Minimum	\$ 136,611,000	\$ 46,899,000	\$ 2,595,000	\$ 4,975,000	
Preferred Option	\$ 131,321,000	\$ 43,463,000	\$ 2,405,000	\$ 4,945,000	\$ 3,022,000

Total NPV Benefits						
	Travel Time Benefit	Vehicle Operation Benefit	CO2 Benefit	Crash Benefit	Project Cost	BCR
Preferred Option	\$ 5,290,000	\$ 3,436,000	\$ 190,000	\$ 30,000	\$ 3,022,000	3.0

Assumptions	
Discount R	4%

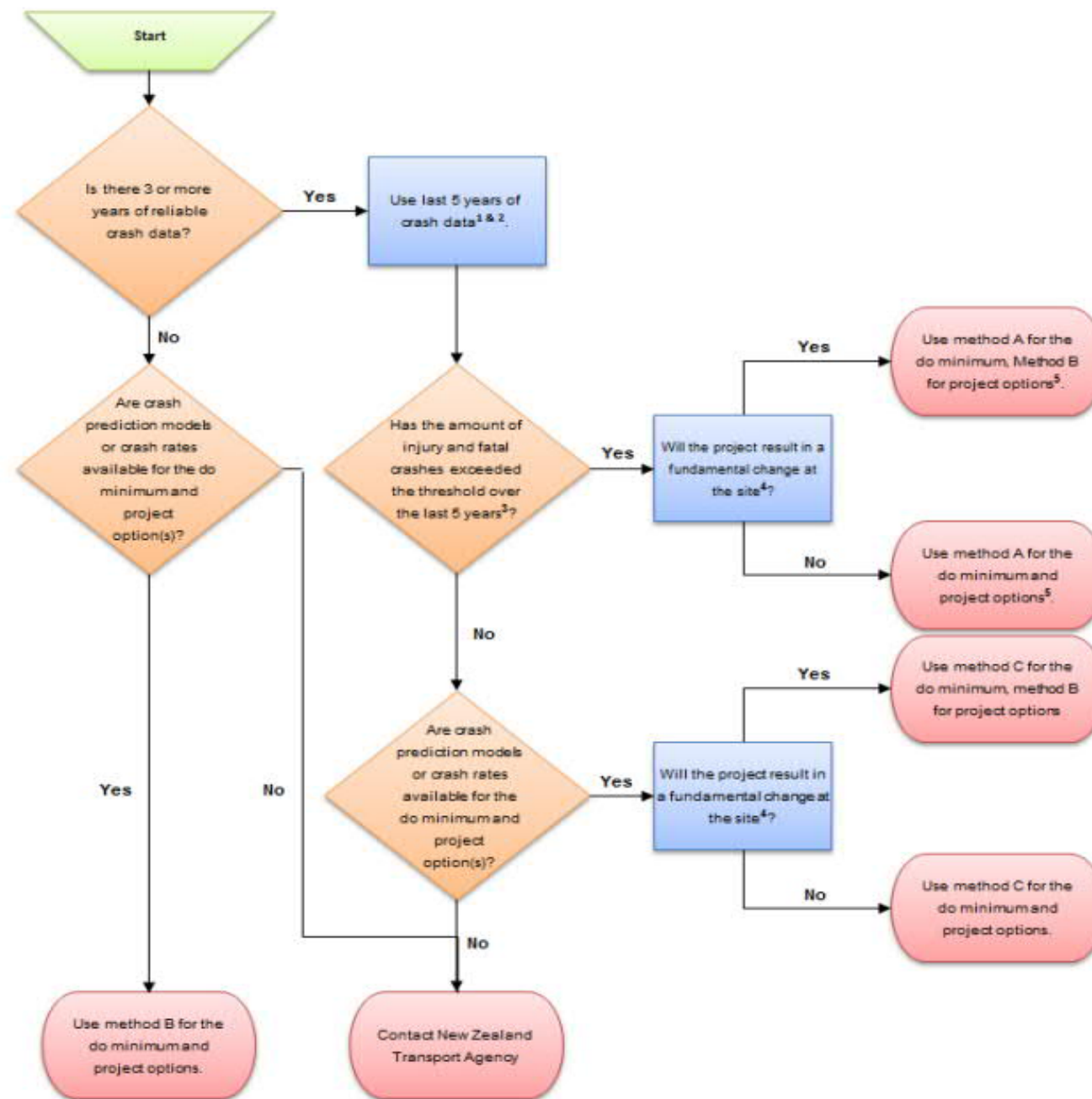
Do Minimum										
	Year	DF	TT	Discounted	VOC	Discounted	CO2	Discounted	Crash Cost	Discounted
	2018		\$ 2,224,734		\$ 1,675,678		\$ 101,979		\$ 200,148	
	2019		\$ 2,369,306		\$ 1,709,318		\$ 104,026		\$ 203,710	
0	2020	1	\$ 2,513,877	\$ 2,513,877	\$ 1,742,958	\$ 1,742,958	\$ 106,073	\$ 106,073	\$ 207,272	\$ 207,272
1	2021	0.961538	\$ 2,658,449	\$ 2,556,201	\$ 1,776,598	\$ 1,708,267	\$ 108,121	\$ 103,962	\$ 210,834	\$ 202,725
2	2022	0.924556	\$ 2,803,021	\$ 2,591,550	\$ 1,810,238	\$ 1,673,667	\$ 110,168	\$ 101,856	\$ 214,396	\$ 198,221
3	2023	0.888996	\$ 2,947,592	\$ 2,620,399	\$ 1,843,878	\$ 1,639,201	\$ 112,215	\$ 99,759	\$ 217,958	\$ 193,764
4	2024	0.854804	\$ 3,092,164	\$ 2,643,195	\$ 1,877,518	\$ 1,604,910	\$ 114,262	\$ 97,672	\$ 221,520	\$ 189,356
5	2025	0.821927	\$ 3,236,736	\$ 2,660,361	\$ 1,911,158	\$ 1,570,833	\$ 116,310	\$ 95,598	\$ 225,082	\$ 185,001
6	2026	0.790315	\$ 3,381,308	\$ 2,672,296	\$ 1,944,798	\$ 1,537,002	\$ 118,357	\$ 93,539	\$ 228,644	\$ 180,701
7	2027	0.759918	\$ 3,525,879	\$ 2,679,378	\$ 1,978,438	\$ 1,503,450	\$ 120,404	\$ 91,497	\$ 232,206	\$ 176,458
8	2028	0.73069	\$ 3,670,451	\$ 2,681,963	\$ 2,012,078	\$ 1,470,206	\$ 122,452	\$ 89,474	\$ 235,768	\$ 172,274
9	2029	0.702587	\$ 3,781,803	\$ 2,657,045	\$ 2,024,461	\$ 1,422,360	\$ 123,205	\$ 86,562	\$ 236,999	\$ 166,513
10	2030	0.675564	\$ 3,893,156	\$ 2,630,076	\$ 2,036,844	\$ 1,376,019	\$ 123,959	\$ 83,742	\$ 238,231	\$ 160,940
11	2031	0.649581	\$ 4,004,508	\$ 2,601,252	\$ 2,049,227	\$ 1,331,139	\$ 124,712	\$ 81,011	\$ 239,462	\$ 155,550
12	2032	0.624597	\$ 4,115,860	\$ 2,570,754	\$ 2,061,610	\$ 1,287,676	\$ 125,466	\$ 78,366	\$ 240,693	\$ 150,336
13	2033	0.600574	\$ 4,227,212	\$ 2,538,754	\$ 2,073,993	\$ 1,245,586	\$ 126,220	\$ 75,804	\$ 241,924	\$ 145,293
14	2034	0.577475	\$ 4,338,565	\$ 2,505,413	\$ 2,086,376	\$ 1,204,830	\$ 126,973	\$ 73,324	\$ 243,155	\$ 140,416
15	2035	0.555265	\$ 4,449,917	\$ 2,470,881	\$ 2,098,759	\$ 1,165,366	\$ 127,727	\$ 70,922	\$ 244,386	\$ 135,699
16	2036	0.533908	\$ 4,561,269	\$ 2,435,299	\$ 2,111,142	\$ 1,127,156	\$ 128,480	\$ 68,597	\$ 245,617	\$ 131,137
17	2037	0.513373	\$ 4,672,622	\$ 2,398,799	\$ 2,123,525	\$ 1,090,161	\$ 129,234	\$ 66,345	\$ 246,848	\$ 126,725
18	2038	0.493628	\$ 4,783,974	\$ 2,361,504	\$ 2,135,908	\$ 1,054,344	\$ 129,988	\$ 64,166	\$ 248,079	\$ 122,459
19	2039	0.474642	\$ 4,895,326	\$ 2,323,530	\$ 2,148,291	\$ 1,019,670	\$ 130,741	\$ 62,055	\$ 249,311	\$ 118,333
20	2040	0.456387	\$ 5,006,679	\$ 2,284,983	\$ 2,160,674	\$ 986,103	\$ 131,495	\$ 60,013	\$ 250,542	\$ 114,344
21	2041	0.438834	\$ 5,118,031	\$ 2,245,964	\$ 2,173,057	\$ 953,610	\$ 132,248	\$ 58,035	\$ 251,773	\$ 110,486
22	2042	0.421955	\$ 5,229,383	\$ 2,206,566	\$ 2,185,440	\$ 922,158	\$ 133,002	\$ 56,121	\$ 253,004	\$ 106,756
23	2043	0.405726	\$ 5,340,735	\$ 2,166,877	\$ 2,197,822	\$ 891,714	\$ 133,756	\$ 54,268	\$ 254,235	\$ 103,150
24	2044	0.390121	\$ 5,452,088	\$ 2,126,977	\$ 2,210,205	\$ 862,249	\$ 134,509	\$ 52,475	\$ 255,466	\$ 99,663
25	2045	0.375117	\$ 5,563,440	\$ 2,086,940	\$ 2,222,588	\$ 833,730	\$ 135,263	\$ 50,739	\$ 256,697	\$ 96,291
26	2046	0.360689	\$ 5,674,792	\$ 2,046,837	\$ 2,234,971	\$ 806,130	\$ 136,016	\$ 49,060	\$ 257,928	\$ 93,032
27	2047	0.346817	\$ 5,786,145	\$ 2,006,731	\$ 2,247,354	\$ 779,420	\$ 136,770	\$ 47,434	\$ 259,159	\$ 89,881
28	2048	0.333477	\$ 5,897,497	\$ 1,966,682	\$ 2,259,737	\$ 753,571	\$ 137,524	\$ 45,861	\$ 260,391	\$ 86,834
29	2049	0.320651	\$ 5,897,497	\$ 1,891,041	\$ 2,259,737	\$ 724,588	\$ 137,524	\$ 44,097	\$ 260,391	\$ 83,495
30	2050	0.308319	\$ 5,897,497	\$ 1,818,308	\$ 2,259,737	\$ 696,719	\$ 137,524	\$ 42,401	\$ 260,391	\$ 80,283
31	2051	0.29646	\$ 5,897,497	\$ 1,748,373	\$ 2,259,737	\$ 669,922	\$ 137,524	\$ 40,770	\$ 260,391	\$ 77,195
32	2052	0.285058	\$ 5,897,497	\$ 1,681,128	\$ 2,259,737	\$ 644,156	\$ 137,524	\$ 39,202	\$ 260,391	\$ 74,226
33	2053	0.274094	\$ 5,897,497	\$ 1,616,470	\$ 2,259,737	\$ 619,381	\$ 137,524	\$ 37,694	\$ 260,391	\$ 71,372
34	2054	0.263552	\$ 5,897,497	\$ 1,554,298	\$ 2,259,737	\$ 595,558	\$ 137,524	\$ 36,245	\$ 260,391	\$ 68,626
35	2055	0.253415	\$ 5,897,497	\$ 1,494,517	\$ 2,259,737	\$ 572,652	\$ 137,524	\$ 34,851	\$ 260,391	\$ 65,987
36	2056	0.243669	\$ 5,897,497	\$ 1,437,036	\$ 2,259,737	\$ 550,627	\$ 137,524	\$ 33,510	\$ 260,391	\$ 63,449
37	2057	0.234297	\$ 5,897,497	\$ 1,381,765	\$ 2,259,737	\$ 529,449	\$ 137,524	\$ 32,221	\$ 260,391	\$ 61,009
38	2058	0.225285	\$ 5,897,497	\$ 1,328,620	\$ 2,259,737	\$ 509,086	\$ 137,524	\$ 30,982	\$ 260,391	\$ 58,662
39	2059	0.216621	\$ 5,897,497	\$ 1,277,519	\$ 2,259,737	\$ 489,506	\$ 137,524	\$ 29,790	\$ 260,391	\$ 56,406
40	2060	0.208289	\$ 5,897,497	\$ 1,228,384	\$ 2,259,737	\$ 470,679	\$ 137,524	\$ 28,645	\$ 260,391	\$ 54,236
	Total	20.7928	\$ 199,986,483	\$ 88,708,543	\$ 90,241,488	\$ 42,635,810	\$ 5,491,938	\$ 2,594,740	\$ 10,496,125	\$ 4,974,558

Update Factor	1.540	1.100	1.000	1.000
NPV	\$ 136,611,157	\$ 46,899,391	\$ 2,594,740	\$ 4,974,558

TT	Discounted	Step Change
\$ 2,224,734		
\$ 2,472,685		
\$ 2,720,636	\$ 2,720,636	\$ 2,513,877
\$ 2,968,587	\$ 2,854,410	\$ 2,556,201
\$ 3,216,538	\$ 2,973,870	\$ 2,591,550
\$ 3,464,489	\$ 3,079,918	\$ 2,620,399
\$ 3,712,439	\$ 3,173,409	\$ 2,643,195
\$ 3,960,390	\$ 3,255,152	\$ 2,655,152
\$ 4,208,341	\$ 3,325,913	\$ 3,325,913
\$ 4,456,292	\$ 3,386,416	\$ 3,386,416
\$ 4,704,243	\$ 3,437,344	\$ 3,437,344
\$ 4,858,484	\$ 3,413,507	\$ 3,413,507
\$ 5,012,726	\$ 3,386,418	\$ 3,386,418
\$ 5,166,967	\$ 3,356,363	\$ 3,356,363
\$ 5,321,208	\$ 3,323,611	\$ 3,323,611
\$ 5,475,449	\$ 3,288,413	\$ 3,288,413
\$ 5,629,691	\$ 3,251,006	\$ 3,251,006
\$ 5,783,932	\$ 3,211,612	\$ 3,211,612
\$ 5,938,173	\$ 3,170,439	\$ 3,170,439
\$ 6,092,415	\$ 3,127,683	\$ 3,127,683
\$ 6,246,656	\$ 3,083,525	\$ 3,083,525
\$ 6,400,897	\$ 3,038,137	\$ 3,038,137
\$ 6,555,138	\$ 2,991,680	\$ 2,991,680
\$ 6,709,380	\$ 2,944,301	\$ 2,944,301
\$ 6,863,621	\$ 2,896,142	\$ 2,896,142
\$ 7,017,862	\$ 2,847,332	\$ 2,847,332
\$ 7,172,104	\$ 2,797,992	\$ 2,797,992
\$ 7,326,345	\$ 2,748,235	\$ 2,748,235
\$ 7,480,586	\$ 2,698,167	\$ 2,698,167
\$ 7,634,827	\$ 2,647,885	\$ 2,647,885
\$ 7,789,069	\$ 2,597,479	\$ 2,597,479
\$ 7,789,069	\$ 2,497,576	\$ 2,497,576
\$ 7,789,069	\$ 2,401,515	\$ 2,401,515
\$ 7,789,069	\$ 2,309,149	\$ 2,309,149
\$ 7,789,069	\$ 2,220,336	\$ 2,220,336
\$ 7,789,069	\$ 2,134,938	\$ 2,134,938
\$ 7,789,069	\$ 2,052,825	\$ 2,052,825
\$ 7,789,069	\$ 1,973,870	\$ 1,973,870
\$ 7,789,069	\$ 1,897,952	\$ 1,897,952
\$ 7,789,069	\$ 1,824,954	\$ 1,824,954
\$ 7,789,069	\$ 1,754,764	\$ 1,754,764
\$ 7,789,069	\$ 1,687,273	\$ 1,687,273
\$ 7,789,069	\$ 1,622,378	\$ 1,622,378
\$ 258,053,726	\$ 113,404,524	\$ 111,527,504

Update Factor	1.540
NPV	\$ 171,752,356

Figure A1: Decision process for selecting crash analysis methods



NOTES

1. If 3-5 years of crash data is available then use data that is available.
2. Up to 10 years of data can be used at low volume sites (<1500 AADT) or when looking at vulnerable road users (e.g. pedestrian and/or cyclist). Need to check that there has not been fundamental change or high traffic growth.
3. Threshold for intersections/road sections <1km: 5 or more injury crashes or 2 or more serious and fatal crashes at the site in the last 5 years?
Threshold for road sections >1km: 3 or more injury crashes per kilometre or 1 or more serious and fatal crashes per kilometre at the site in the last 5 years?

Tahunau Drive / Maire Road Intersection 2014 - 2018 Crash Data				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
Total	0	0	0	4
Selecting crash analysis methods				
Question				Answer
Is there 3 or more years of reliable crash data?				Yes
Has the amount of crashes exceeded threshold over the last 5 years?				No
Are crash prediction models or crash rate rates available?				Yes
Will the project result in a fundamental change to the site				Yes
Method C for do minimum and method B for project options				

Tahunau Drive / Parkers Road Intersection 2014 - 2018 Crash Data				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
Total	0	0	2	9
Selecting crash analysis methods				
Question				Answer
Is there 3 or more years of reliable crash data?				Yes
Has the amount of crashes exceeded threshold over the last 5 years?				No
Are crash prediction models or crash rate rates available?				Yes
Will the project result in a fundamental change to the site				Yes
Method C for do minimum and method B for project options				

Project option: Tahunaui Drive / Maire Road
 Posted speed limit 60 Traffic growth rate 1%
 Road category Time zero 2018

Site specific	
1 Number of crash year history	5
2 Number of injury crashes	0
3 Crash tend adjustment factor	0.86
4 Site specific crash rate (crashes per year), As	0.0

Crash prediction model for 2018 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	900
6 Highest or primary AADT, Qmajor	19600
7 Typical crash rate (crashes per year), AT,dm	0.35

Crash prediction model for 2028 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	1000
6 Highest or primary AADT, Qmajor	23700
7 Typical crash rate (crashes per year), AT,dm	0.41

Crash prediction model for 2048 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	1000
6 Highest or primary AADT, Qmajor	26300
7 Typical crash rate (crashes per year), AT,dm	0.45

Crash prediction model for 2028 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	900
6 Highest or primary AADT, Qmajor	23600
7 Typical crash rate (crashes per year), AT,dm	0.40

Crash prediction model for 2048 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	900
6 Highest or primary AADT, Qmajor	26100
7 Typical crash rate (crashes per year), AT,dm	0.43

Crash prediction model for 2028 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.131
3 Parameter b1	0.04
4 Parameter b2	0.12
5 Lowest or sideroad AADT, Qminor	2000
6 Highest or primary AADT, Qmajor	20500
7 Typical crash rate (crashes per year), AT,dm	0.49

Crash prediction model for 2048 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.131
3 Parameter b1	0.04
4 Parameter b2	0.12
5 Lowest or sideroad AADT, Qminor	2400
6 Highest or primary AADT, Qmajor	23500
7 Typical crash rate (crashes per year), AT,dm	0.50

Project option: Tahunaui Drive / Parkers Road
 Posted speed limit 60 Traffic growth rate 1%
 Road category Time zero 2018

Site specific	
1 Number of crash year history	5
2 Number of injury crashes	2
3 Crash tend adjustment factor	0.86
4 Site specific crash rate (crashes per year), As	0.3

Crash prediction model for 2018 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	5200
6 Highest or primary AADT, Qmajor	19100
7 Typical crash rate (crashes per year), AT,dm	0.49

Crash prediction model for 2028 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	5600
6 Highest or primary AADT, Qmajor	23200
7 Typical crash rate (crashes per year), AT,dm	0.57

Crash prediction model for 2048 Do Minimum	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	6700
6 Highest or primary AADT, Qmajor	25700
7 Typical crash rate (crashes per year), AT,dm	0.64

Crash prediction model for 2028 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	5500
6 Highest or primary AADT, Qmajor	23100
7 Typical crash rate (crashes per year), AT,dm	0.57

Crash prediction model for 2048 Walking and Cycling and PT Service Improvements	
1 Table used	Table 13
2 Parameter b0	0.0000489
3 Parameter b1	0.76
4 Parameter b2	0.2
5 Lowest or sideroad AADT, Qminor	6700
6 Highest or primary AADT, Qmajor	25600
7 Typical crash rate (crashes per year), AT,dm	0.64

Crash prediction model for 2028 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.131
3 Parameter b1	0.04
4 Parameter b2	0.12
5 Lowest or sideroad AADT, Qminor	5300
6 Highest or primary AADT, Qmajor	19100
7 Typical crash rate (crashes per year), AT,dm	0.54

Crash prediction model for 2048 Preferred Option	
1 Table used	Table 13
2 Parameter b0	0.131
3 Parameter b1	0.04
4 Parameter b2	0.12
5 Lowest or sideroad AADT, Qminor	6900
6 Highest or primary AADT, Qmajor	21700
7 Typical crash rate (crashes per year), AT,dm	0.56

Tahunaui Drive / Maire Road				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	4
2017	0	0	0	0
2018	0	0	0	0
Total	0	0	0	4

Tahunaui Drive / Parkers Road				
	Fatal Crash	Serious Crash	Minor Crash	Non-Injury Crash
2014	0	0	0	2
2015	0	0	1	2
2016	0	0	1	0
2017	0	0	0	0
2018	0	0	0	1
Total	0	0	2	5

Table A13: Crash trend adjustments factors

Speed limit	Traffic growth rate							
	0%	1%	2%	3%	4%	5%	6%	7%
50 and 60km/h	0.83	0.86	0.90	0.93	0.96	0.99	1.03	1.06
70km/h and above	0.95	0.98	1.02	1.06	1.10	1.14	1.17	1.21

1% traffic growth rate between 50 and 60 km/h 0.86

Walking and Cycling and PT Service Improvements									
VOC	Discounted	Step Change	CO2	Discounted	Step Change	Crash Cost	Discounted	Step Change	Notes
\$ 1,675,678			\$ 101,979			\$ 200,148			
\$ 1,708,946			\$ 104,003			\$ 203,379			
\$ 1,742,215	\$ 1,742,215	\$ 1,742,958	\$ 106,028	\$ 106,028	\$ 106,073	\$ 206,610	\$ 206,610	\$ 207,272	
\$ 1,775,484	\$ 1,707,196	\$ 1,708,267	\$ 108,053	\$ 103,897	\$ 103,962	\$ 209,841	\$ 201,771	\$ 202,725	
\$ 1,808,753	\$ 1,672,294	\$ 1,673,667	\$ 110,078	\$ 101,773	\$ 101,856	\$ 213,073	\$ 196,998	\$ 198,221	Option Construction
\$ 1,842,022	\$ 1,637,551	\$ 1,639,201	\$ 112,102	\$ 99,658	\$ 99,759	\$ 216,304	\$ 192,293	\$ 193,764	Option Construction
\$ 1,875,291	\$ 1,603,006	\$ 1,604,910	\$ 114,127	\$ 97,556	\$ 97,672	\$ 219,535	\$ 187,659	\$ 189,356	Option Construction
\$ 1,908,559	\$ 1,568,697	\$ 1,568,697	\$ 116,152	\$ 95,468	\$ 95,468	\$ 222,766	\$ 183,097	\$ 183,097	
\$ 1,941,828	\$ 1,534,655	\$ 1,534,655	\$ 118,176	\$ 93,396	\$ 93,396	\$ 225,997	\$ 178,609	\$ 178,609	
\$ 1,975,097	\$ 1,500,911	\$ 1,500,911	\$ 120,201	\$ 91,343	\$ 91,343	\$ 229,228	\$ 174,195	\$ 174,195	
\$ 2,008,366	\$ 1,467,493	\$ 1,467,493	\$ 122,226	\$ 89,309	\$ 89,309	\$ 232,459	\$ 169,856	\$ 169,856	
\$ 2,016,828	\$ 1,416,996	\$ 1,416,996	\$ 122,741	\$ 86,236	\$ 86,236	\$ 233,692	\$ 164,189	\$ 164,189	
\$ 2,025,289	\$ 1,368,213	\$ 1,368,213	\$ 123,256	\$ 83,267	\$ 83,267	\$ 234,924	\$ 158,706	\$ 158,706	
\$ 2,033,751	\$ 1,321,086	\$ 1,321,086	\$ 123,771	\$ 80,399	\$ 80,399	\$ 236,156	\$ 153,402	\$ 153,402	
\$ 2,042,213	\$ 1,275,560	\$ 1,275,560	\$ 124,285	\$ 77,628	\$ 77,628	\$ 237,388	\$ 148,272	\$ 148,272	
\$ 2,050,675	\$ 1,231,582	\$ 1,231,582	\$ 124,800	\$ 74,952	\$ 74,952	\$ 238,620	\$ 143,309	\$ 143,309	
\$ 2,059,137	\$ 1,189,100	\$ 1,189,100	\$ 125,315	\$ 72,367	\$ 72,367	\$ 239,853	\$ 138,509	\$ 138,509	
\$ 2,067,599	\$ 1,148,064	\$ 1,148,064	\$ 125,830	\$ 69,869	\$ 69,869	\$ 241,085	\$ 133,866	\$ 133,866	
\$ 2,076,060	\$ 1,108,426	\$ 1,108,426	\$ 126,345	\$ 67,457	\$ 67,457	\$ 242,317	\$ 129,375	\$ 129,375	
\$ 2,084,522	\$ 1,070,138	\$ 1,070,138	\$ 126,860	\$ 65,127	\$ 65,127	\$ 243,549	\$ 125,032	\$ 125,032	
\$ 2,092,984	\$ 1,033,156	\$ 1,033,156	\$ 127,375	\$ 62,876	\$ 62,876	\$ 244,781	\$ 120,831	\$ 120,831	
\$ 2,101,446	\$ 997,435	\$ 997,435	\$ 127,890	\$ 60,702	\$ 60,702	\$ 246,014	\$ 116,769	\$ 116,769	
\$ 2,109,908	\$ 962,934	\$ 962,934	\$ 128,405	\$ 58,602	\$ 58,602	\$ 247,246	\$ 112,840	\$ 112,840	
\$ 2,118,370	\$ 929,612	\$ 929,612	\$ 128,920	\$ 56,575	\$ 56,575	\$ 248,478	\$ 109,041	\$ 109,041	
\$ 2,126,831	\$ 897,428	\$ 897,428	\$ 129,435	\$ 54,616	\$ 54,616	\$ 249,710	\$ 105,367	\$ 105,367	
\$ 2,135,293	\$ 866,345	\$ 866,345	\$ 129,950	\$ 52,724	\$ 52,724	\$ 250,943	\$ 101,814	\$ 101,814	
\$ 2,143,755	\$ 836,325	\$ 836,325	\$ 130,465	\$ 50,897	\$ 50,897	\$ 252,175	\$ 98,379	\$ 98,379	
\$ 2,152,217	\$ 807,333	\$ 807,333	\$ 130,980	\$ 49,133	\$ 49,133	\$ 253,407	\$ 95,057	\$ 95,057	
\$ 2,160,679	\$ 779,334	\$ 779,334	\$ 131,495	\$ 47,429	\$ 47,429	\$ 254,639	\$ 91,846	\$ 91,846	
\$ 2,169,141	\$ 752,294	\$ 752,294	\$ 132,010	\$ 45,783	\$ 45,783	\$ 255,871	\$ 88,740	\$ 88,740	
\$ 2,177,602	\$ 726,181	\$ 726,181	\$ 132,525	\$ 44,194	\$ 44,194	\$ 257,104	\$ 85,738	\$ 85,738	
\$ 2,177,602	\$ 698,251	\$ 698,251	\$ 132,525	\$ 42,494	\$ 42,494	\$ 257,104	\$ 82,441	\$ 82,441	
\$ 2,177,602	\$ 671,396	\$ 671,396	\$ 132,525	\$ 40,860	\$ 40,860	\$ 257,104	\$ 79,270	\$ 79,270	
\$ 2,177,602	\$ 645,573	\$ 645,573	\$ 132,525	\$ 39,288	\$ 39,288	\$ 257,104	\$ 76,221	\$ 76,221	
\$ 2,177,602	\$ 620,743	\$ 620,743	\$ 132,525	\$ 37,777	\$ 37,777	\$ 257,104	\$ 73,289	\$ 73,289	
\$ 2,177,602	\$ 596,868	\$ 596,868	\$ 132,525	\$ 36,324	\$ 36,324	\$ 257,104	\$ 70,471	\$ 70,471	
\$ 2,177,602	\$ 573,912	\$ 573,912	\$ 132,525	\$ 34,927	\$ 34,927	\$ 257,104	\$ 67,760	\$ 67,760	
\$ 2,177,602	\$ 551,838	\$ 551,838	\$ 132,525	\$ 33,584	\$ 33,584	\$ 257,104	\$ 65,154	\$ 65,154	
\$ 2,177,602	\$ 530,614	\$ 530,614	\$ 132,525	\$ 32,292	\$ 32,292	\$ 257,104	\$ 62,648	\$ 62,648	
\$ 2,177,602	\$ 510,205	\$ 510,205	\$ 132,525	\$ 31,050	\$ 31,050	\$ 257,104	\$ 60,239	\$ 60,239	
\$ 2,177,602	\$ 490,582	\$ 490,582	\$ 132,525	\$ 29,856	\$ 29,856	\$ 257,104	\$ 57,922	\$ 57,922	
\$ 2,177,602	\$ 471,714	\$ 471,714	\$ 132,525	\$ 28,708	\$ 28,708	\$ 257,104	\$ 55,694	\$ 55,694	
\$ 2,177,602	\$ 453,571	\$ 453,571	\$ 132,525	\$ 27,604	\$ 27,604	\$ 257,104	\$ 53,552	\$ 53,552	
\$ 88,337,770	\$ 41,966,826	\$ 41,973,567	\$ 5,376,081	\$ 2,554,027	\$ 2,554,437	\$ 10,372,535	\$ 4,916,828	\$ 4,922,836	

TT	Discounted	Step Change
\$ 2,224,734		
\$ 2,295,659		
\$ 2,366,584	\$ 2,366,584	\$ 2,513,877
\$ 2,437,510	\$ 2,343,759	\$ 2,556,201
\$ 2,508,435	\$ 2,319,189	\$ 2,591,550
\$ 2,579,360	\$ 2,293,042	\$ 2,620,399
\$ 2,650,285	\$ 2,265,475	\$ 2,643,195
\$ 2,721,210	\$ 2,236,636	\$ 3,255,152
\$ 2,792,135	\$ 2,206,665	\$ 3,325,913
\$ 2,863,061	\$ 2,175,691	\$ 3,386,416
\$ 2,933,986	\$ 2,143,835	\$ 3,437,344
\$ 3,026,700	\$ 2,126,520	\$ 3,413,507
\$ 3,119,415	\$ 2,107,365	\$ 3,386,418
\$ 3,212,130	\$ 2,086,538	\$ 3,356,363
\$ 3,304,844	\$ 2,064,196	\$ 3,323,611
\$ 3,397,575	\$ 2,040,486	\$ 3,288,413
\$ 3,490,274	\$ 2,015,546	\$ 2,015,546
\$ 3,582,988	\$ 1,989,506	\$ 1,989,506
\$ 3,675,703	\$ 1,962,488	\$ 1,962,488
\$ 3,768,418	\$ 1,934,605	\$ 1,934,605
\$ 3,861,132	\$ 1,905,964	\$ 1,905,964
\$ 3,953,847	\$ 1,876,664	\$ 1,876,664
\$ 4,046,562	\$ 1,846,798	\$ 1,846,798
\$ 4,139,276	\$ 1,816,454	\$ 1,816,454
\$ 4,231,991	\$ 1,785,711	\$ 1,785,711
\$ 4,324,706	\$ 1,754,647	\$ 1,754,647
\$ 4,417,420	\$ 1,723,331	\$ 1,723,331
\$ 4,510,135	\$ 1,691,827	\$ 1,691,827
\$ 4,602,850	\$ 1,660,198	\$ 1,660,198
\$ 4,695,564	\$ 1,628,500	\$ 1,628,500
\$ 4,788,279	\$ 1,596,783	\$ 1,596,783
\$ 4,788,279	\$ 1,535,368	\$ 1,535,368
\$ 4,788,279	\$ 1,476,316	\$ 1,476,316
\$ 4,788,279	\$ 1,419,534	\$ 1,419,534
\$ 4,788,279	\$ 1,364,937	\$ 1,364,937
\$ 4,788,279	\$ 1,312,439	\$ 1,312,439
\$ 4,788,279	\$ 1,261,961	\$ 1,261,961
\$ 4,788,279	\$ 1,213,424	\$ 1,213,424
\$ 4,788,279	\$ 1,166,754	\$ 1,166,754
\$ 4,788,279	\$ 1,121,879	\$ 1,121,879
\$ 4,788,279	\$ 1,078,729	\$ 1,078,729
\$ 4,788,279	\$ 1,037,240	\$ 1,037,240
\$ 4,788,279	\$ 997,346	\$ 997,346
\$ 163,982,101	\$ 72,950,930	\$ 85,273,308

		1.100			1.000				1.000
		\$ 46,170,924			\$ 2,554,437			\$ 4,922,836	

Update Factor		1.540
NPV		\$ 131,320,895

Do Minimum Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1988.4	55.8	0.83
2018 IP	1708.5	32.1	
2018 PM	2127	71	
2028 Do Min AM	2265.6	88.7	0.98
2028 Do Min IP	2114.6	63.6	
2028 Do Min PM	2338.5	63.6	
2048 Do Min AM	2313	95	
2048 Do Min IP	2425.2	108.1	1.08
2048 Do Min PM	2588.7	118.1	

Do Minimum				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,224,734	\$ 1,675,678	\$ 101,979	\$ 200,148	
2028				
\$ 3,670,451	\$ 2,012,078	\$ 122,452	\$ 235,768	
2048				
\$ 5,897,497	\$ 2,259,737	\$ 137,524	\$ 260,391	

TT and	
Item	Value
TT \$/hr	16.27
VOC cents/km	27.6
Generalised Day	245
Weekdays	245
Other days	120
Assume 0% traffic on other days	0

Walking and Cycling and PT Service Improvements Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1988.4	55.8	0.83
2018 IP	1708.5	32.1	
2018 PM	2127	71	
2028 Package 2 AM	2229.7	64.6	0.97
2028 Package 2 IP	2124.5	79.1	
2028 Package 2 PM	2292.1	143.5	
2048 Package 2 AM	2278.2	100.9	
2048 Package 2 IP	2344.8	138.2	1.07
2048 Package 2 PM	2403.9	205	

Walking and Cycling and PT Service Improvements				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,224,734	\$ 1,675,678	\$ 101,979	\$ 200,148	
2028				
\$ 4,704,243	\$ 2,008,366	\$ 122,226	\$ 232,459	
2048				
\$ 7,789,069	\$ 2,177,602	\$ 132,525	\$ 257,104	

Peak to AADT Factor	
Peak	Factor
AM	1.87
IP	10
PM	1.87

Preferred Option Statistics			
	Total Travel Distance (km)	Total Travel Time (hr)	Crash Rate
2018 AM	1988.4	55.8	0.83
2018 IP	1708.5	32.1	
2018 PM	2127	71	
2028 Package 2 + 3 AM	1958	47.4	1.03
2028 Package 2 + 3 IP	1743.7	44.9	
2028 Package 2 + 3 PM	2215.7	106.1	
2048 Package 2 + 3 AM	1999	54.6	
2048 Package 2 + 3 IP	2076.3	79.6	1.06
2048 Package 2 + 3 PM	2276.6	162.1	

Preferred Option				
TT Cost	VOC	CO2	Crash Cost	
2018				
\$ 2,224,734	\$ 1,675,678	\$ 101,979	\$ 200,148	
2028				
\$ 2,933,986	\$ 1,706,852	\$ 103,876	\$ 246,941	
2048				
\$ 4,788,279	\$ 1,944,641	\$ 118,347	\$ 255,056	

CO2	
Item	Value
LV CO2	0.0009
HCV CO2	0.0016
Generalised CO2	0.000928
CO2 value/ton	\$65.58
LV%	96%
HCV%	4%

Crash Cost	
Item	Value
For 50km/h, Priority T	\$ 240,000
For 50km/h, Signalised T	\$ 235,000

Projects

Tahunanui / Parkers / Maire signalised intersecti

VOC
Source and Assumptions
Table 17 Urban Arterial all periods
Table A72 50kph and 0% gradient

Table A72: LCV VOC by speed and gradient (cents/km – July 2015)

Speed (km/h)	Gradient in percent (both directions)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
10	44.2	44.2	44.3	44.3	44.5	44.7	44.9	45.2	45.6	46.1	46.7	47.3	48.1
15	39.2	39.3	39.4	39.5	39.8	40.0	40.4	40.8	41.4	42.0	42.7	43.5	44.4
20	35.5	35.6	35.7	35.9	36.2	36.6	37.0	37.5	38.1	38.8	39.6	40.5	41.5
25	32.9	33.0	33.1	33.3	33.6	34.0	34.5	35.0	35.7	36.4	37.3	38.3	39.4
30	30.9	31.0	31.2	31.4	31.8	32.2	32.7	33.2	33.9	34.7	35.7	36.7	37.8
35	29.6	29.7	29.8	30.1	30.4	30.8	31.4	32.0	32.7	33.5	34.5	35.6	36.8
40	28.6	28.7	28.9	29.2	29.5	29.9	30.5	31.1	31.8	32.7	33.7	34.8	36.0
45	28.0	28.1	28.3	28.5	28.9	29.3	29.9	30.5	31.3	32.2	33.2	34.3	35.6
50	27.6	27.7	27.9	28.2	28.5	29.0	29.5	30.2	31.0	31.9	32.9	34.1	35.4
55	27.5	27.6	27.8	28.0	28.4	28.8	29.4	30.1	30.9	31.8	32.8	34.0	35.3
60	27.5	27.6	27.8	28.0	28.4	28.9	29.4	30.1	30.9	31.9	32.9	34.1	35.5
65	27.7	27.8	27.9	28.2	28.6	29.0	29.6	30.3	31.1	32.0	33.1	34.3	35.7
70	28.0	28.0	28.2	28.5	28.8	29.3	29.9	30.6	31.4	32.3	33.4	34.7	36.0
75	28.3	28.4	28.6	28.8	29.2	29.7	30.2	30.9	31.8	32.7	33.8	35.1	36.4
80	28.8	28.9	29.0	29.3	29.6	30.1	30.7	31.4	32.2	33.2	34.3	35.5	36.9
85	29.3	29.4	29.5	29.8	30.1	30.6	31.2	31.9	32.7	33.7	34.8	36.1	37.5
90	29.9	30.0	30.1	30.4	30.7	31.2	31.8	32.5	33.3	34.3	35.4	36.7	38.1
95	30.5	30.6	30.7	31.0	31.3	31.8	32.4	33.1	34.0	34.9	36.1	37.3	38.8
100	31.2	31.3	31.4	31.7	32.0	32.5	33.1	33.8	34.6	35.6	36.7	38.0	39.5
105	31.9	32.0	32.1	32.4	32.7	33.2	33.8	34.5	35.3	36.3	37.5	38.8	40.2
110	32.7	32.7	32.9	33.1	33.4	33.9	34.5	35.2	36.1	37.1	38.2	39.5	41.0
115	33.5	33.5	33.6	33.9	34.2	34.7	35.3	36.0	36.8	37.8	39.0	40.3	41.7
120	34.3	34.3	34.4	34.7	35.0	35.5	36.1	36.8	37.6	38.6	39.8	41.1	42.5

2
Source and Assumptions
MBCM
MBCM
MBCM
Average observation from SATURN model
Average observation from SATURN model

Road links

For road links, vehicle operating costs (VOC, 2015 base date) are calculated by summing running costs and roughness costs. The fuel cost component of running costs is approximately 50%, while for roughness costs the fuel cost component is negligible.

The following formulae can be used to determine CO₂ emissions:

- light vehicle CO₂ (in tonnes) = VOC(\$)/0.0009
- heavy vehicle CO₂ (in tonnes) = VOC(\$)/0.0016.

The value of NZ\$65.58 per tonne of CO₂ (as at June 2016) should be used for project evaluation. This is based on the [Austroads \(2012\)](#) value.

Cost
Source and Assumptions
Crash Estimation Compendium
Crash Estimation Compendium

Table A28: Cost per reported injury crash (\$000 2015)

Crash site/type	Speed limit area (\$000 2015)			
	50km/h	70km/h	100km/h near rural	100km/h remote rural
All other sites	220	340	580	905
Mid-block crashes	275	435	585	850
Intersection crashes:				
Uncontrolled T	195	375	530	820
Roundabout	210	340	545	645
Priority T & Y	240	295	565	880
Priority X	230	305	575	890
Signalised T, Y	235	280	545	855
Signalised X	220	265	620	960

	Project Expected Estimate	95th percentile Project Estimate	Construction Period	Separate Spreadsheet
ion	\$ 3,397,413	\$ 4,181,196	2022 - end of 2024	Cost_Tahunanui_Parkers_Maire signalised intersection DBE May 2021.xls

Do Minimum

2018 - Do Min - AM		2028 - Do Min - AM		2048 - Do Min - AM	
Travel Speed (Average)	35.7 km/h	Travel Speed (Average)	25.5 km/h	Travel Speed (Average)	24.3 km/h
Travel Distance (Total)	1988.4 veh-km/h	Travel Distance (Total)	2265.6 veh-km/h	Travel Distance (Total)	2313 veh-km/h
Travel Time (Total)	55.8 veh-h/h	Travel Time (Total)	88.7 veh-h/h	Travel Time (Total)	95 veh-h/h

2018 - Do Min - IP		2028 - Do Min - IP		2048 - Do Min - IP	
Travel Speed (Average)	53.2 km/h	Travel Speed (Average)	33.3 km/h	Travel Speed (Average)	22.4 km/h
Travel Distance (Total)	1708.5 veh-km/h	Travel Distance (Total)	2114.6 veh-km/h	Travel Distance (Total)	2425.2 veh-km/h
Travel Time (Total)	32.1 veh-h/h	Travel Time (Total)	63.6 veh-h/h	Travel Time (Total)	108.1 veh-h/h

2018 - Do Min - IP		2028 - Do Min - PM		2048 - Do Min - PM	
Travel Speed (Average)	30 km/h	Travel Speed (Average)	36.8 km/h	Travel Speed (Average)	21.9 km/h
Travel Distance (Total)	2127 veh-km/h	Travel Distance (Total)	2338.5 veh-km/h	Travel Distance (Total)	2588.7 veh-km/h
Travel Time (Total)	71 veh-h/h	Travel Time (Total)	63.6 veh-h/h	Travel Time (Total)	118.1 veh-h/h

Walking and Cycling and PT Service Improvements

2028 - Walking and Cycling and PT Service Improvements - AM		2048 - Walking and Cycling and PT Service Improvements - AM	
Travel Speed (Average)	34.5 km/h	Travel Speed (Average)	22.6 km/h
Travel Distance (Total)	2229.7 veh-km/h	Travel Distance (Total)	2278.2 veh-km/h
Travel Time (Total)	64.6 veh-h/h	Travel Time (Total)	100.9 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - IP		2048 - Walking and Cycling and PT Service Improvements - IP	
Travel Speed (Average)	26.9 km/h	Travel Speed (Average)	17 km/h
Travel Distance (Total)	2124.5 veh-km/h	Travel Distance (Total)	2344.8 veh-km/h
Travel Time (Total)	79.1 veh-h/h	Travel Time (Total)	138.2 veh-h/h

2028 - Walking and Cycling and PT Service Improvements - PM		2048 - Walking and Cycling and PT Service Improvements - PM	
Travel Speed (Average)	16 km/h	Travel Speed (Average)	11.7 km/h
Travel Distance (Total)	2292.1 veh-km/h	Travel Distance (Total)	2403.9 veh-km/h
Travel Time (Total)	143.5 veh-h/h	Travel Time (Total)	205 veh-h/h

Preferred Option

2028 - Preferred Option - AM		2048 - Preferred Option - AM	
Travel Speed (Average)	41.3 km/h	Travel Speed (Average)	36.6 km/h
Travel Distance (Total)	1958 veh-km/h	Travel Distance (Total)	1999 veh-km/h
Travel Time (Total)	47.4 veh-h/h	Travel Time (Total)	54.6 veh-h/h

2028 - Preferred Option - IP		2048 - Preferred Option - IP	
Travel Speed (Average)	38.9 km/h	Travel Speed (Average)	26.1 km/h
Travel Distance (Total)	1743.7 veh-km/h	Travel Distance (Total)	2076.3 veh-km/h
Travel Time (Total)	44.9 veh-h/h	Travel Time (Total)	79.6 veh-h/h

2028 - Preferred Option - PM		2048 - Preferred Option - PM	
Travel Speed (Average)	20.9 km/h	Travel Speed (Average)	14 km/h
Travel Distance (Total)	2215.7 veh-km/h	Travel Distance (Total)	2276.6 veh-km/h
Travel Time (Total)	106.1 veh-h/h	Travel Time (Total)	162.1 veh-h/h