In the Environment Court of New Zealand
Auckland Registry

I Mua I Te Kōti Taiao O Aotearoa
Ki Tāmaki Makaurau

ENV-2023-AKL-160

Under   the Resource Management Act 1991

In the matter of   An application for a direct referral to the Environment Court
                under section 87G of the Act for an order granting the
                applicant's resource consent applications to construct and
                operate a new asphalt plant at 54 Aerodrome Road, Mt
                Maunganui, together with an application for consent to
                authorise the continued operation of the existing asphalt plant
                on the site pending construction of the new plant

Between   **Allied Asphalt Limited**

                Applicant

And   **Bay of Plenty Regional Council and Tauranga City Council**

                Consent Authorities

Supplementary Statement of Evidence of Judith Victoria Makinson

Dated 26 April 2024

Counsel acting:
Stephen Christensen
Project Barrister
421 Highgate, Dunedin 9010
p 027 448 2325
stephen@projectbarrister.nz

Qualifications and experience

1   My full name is Judith Victoria Makinson. I am a Director at CKL NZ Ltd, specialising in transportation engineering.

2   I confirm the qualifications and experience set out in my evidence in chief dated 28 February 2024. My role on the project also remains as set out in my evidence in chief.

Code of Conduct for Expert Witnesses

3   I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

4   In preparing this supplementary evidence I have supervised the development of a gravity model to assess the relative merits of five alternative sites in terms of transportation costs and also vehicle kilometres travelled (**VKT**). I have also considered a permitted baseline in terms of traffic generation for the site.

5   In preparing this supplementary statement of evidence I have considered the following documents:

      (a)   the statements of evidence on operational matters prepared by Mr Brian Palmer;

      (b)   the Land Information New Zealand **(LINZ)** database (for suburb populations)[1]

      (c)   the Land Information New Zealand **(LINZ)** database (for road corridor alignments and lengths)[2]

      (d)   the Ministry of Transport 'Domestic Transport Costs and Charges Study' **(MOT Database)**[3]

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[1] https://data.linz.govt.nz/layer/113764-nz-suburbs-and-localities/

[2] NZ Roads: Road Section Geometry | LINZ Data Service

[3] https://www.transport.govt.nz/assets/Uploads/DTCC-WP-C5-Road-VOC-June-2023.pdf

(e)   the Draft SmartGrowth Strategy 2023-2073 **(SmartGrowth)**[4]

(f)   New Zealand Transport Agency Research Report 453 'Trips and Parking Related to Land Use' November 2011 (**RR453**)

6   This evidence should be read in conjunction with my evidence in chief of 28 February 2024.

Executive Summary

7   I have supervised the development of a gravity model to assess the relative traffic effects of a number of alternative locations for an asphalt plant as follows:

(a)   54 Aerodrome Road, Mount Maunganui

(b)   Poplar Lane Quarry, Poplar Lane

(c)   576 Te Puke Highway, Te Puke

(d)   70 Belk Road, Omanawa,Tauriko

(e)   110 Young Road, Paengaroa, Rangiuru

8   Within the gravity model, I have considered five traffic movement components as follows:

(a)   Component 1 Employee movements – staff travelling to and from site;

(b)   Component 2 Inbound materials traffic – raw materials delivered to the plant for processing;

(c)   Component 3 Tauranga product (future growth and development) – plant product delivered within Tauranga City and other neighbouring suburbs used for growth and development;

(d)   Component 4 External product (future growth and development as well as maintenance and renewals) – plant product delivered across the wider Bay of Plenty Region and also to areas beyond that; and

(e)   Component 5 Renewals and maintenance product within Tauranga – plant product delivered within Tauranga City and other neighbouring suburbs used for renewals and maintenance of existing roads.

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[4] SmartGrowth Strategy 2023-2073 Draft for consultation (tauranga.govt.nz)

9   I have allowed for market growth within the gravity model assuming a 500 tonnes / day typical production at present, increasing to approximately 900 tonnes / day by the end of the consent lifetime. I have also applied a vehicle operating cost weighting factor within the assessment to recognise the higher costs of running heavy commercial vehicles (**HCV**s) compared to light vehicles. I have then summed together the five individual components to identify the site that is the most optimal location from a transportation cost perspective.

10   As part of the gravity model, a sensitivity analysis has also been completed to assess the impact on the total score and rank for each site following a change in one of the five components. Since the Renewals and Maintenance Product component has the largest impact on the total score, I have chosen to change this component.

11   Overall, a site in Tauriko would have the lowest transportation cost associated with it followed by the existing site in Mount Manganui based on the gravity model approach.

12   I have also calculated the total VKT for each of the five alternative sites. I have considered all daily employee movements, and the inbound and outbound delivery movements as part of this calculation. The Mount Maunganui site is the best option in terms of daily VKT.

13   In terms of a permitted baseline of traffic effects I assess that the site could reasonably be expected to generate up to 595 vehicle trips per day (**vpd**) under manufacturing use assuming 50% building coverage of the 0.7ha site. I assess daily traffic generation at the 30-year horizon to be some 256vpd, which is significantly below this permitted baseline.

14   When considering both VKT and gravity model results in conjunction, I consider that either the existing site at Mount Maunganui or a site in Tauriko would be preferred from a transportation perspective.

Alternative Site Assessment

15   I have supervised the development of a gravity model[5] to assess the relative traffic effects of a number of alternative locations for an asphalt plant. This model is based on typical daily operations allowing for market growth over 30 years i.e. 900 tonnes production / day.

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[5] A gravity model is an industry standard method to determine the likely origin and destinations of trips. It is derived from Newton's Law of Gravity where the attractive force is proportional to mass (e.g. population) and inversely proportional to the square of the distance.

16   The site currently exists at 54 Aerodrome Road, Mount Maunganui. The four alternative sites I have considered are described in more detail in the evidence of Mr Batchelar and are located at:

(a)   Poplar Lane Quarry, Poplar Lane (**Poplar Lane**)

(b)   576 Te Puke Highway, Te Puke (**Te Puke**)

(c)   70 Belk Road, Omanawa (**Tauriko**)

(d)   110 Young Road, Paengaroa (**Rangiuru**)

17   These locations represent existing industrial zoned land in and around Tauranga, with individual sites being chosen as being representative of the area. These sites have been chosen for assessment purposes only and should not be taken to imply that an asphalt plant is to be developed on any given site. The relative location of the five sites is shown in **Figure 1**.
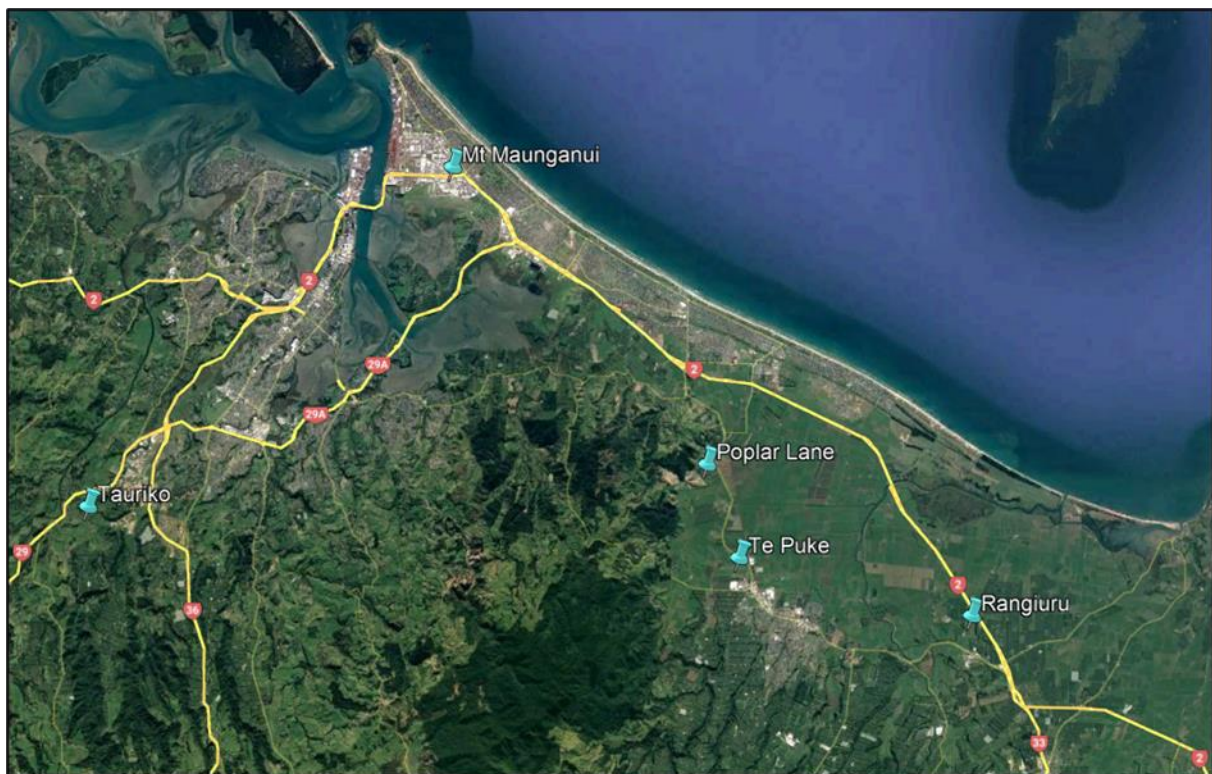
Figure 1: Alternative Site Locations

18   Within the gravity model, I have considered five traffic movement components as follows:

(a)   Component 1 Employee movements – staff travelling to and from site;

(b)   Component 2 Inbound materials traffic – raw materials delivered to the plant for processing;

(c)   Component 3 Tauranga product (future growth and development) – plant product delivered within Tauranga City and other neighbouring suburbs used for growth and development;

(d)   Component 4 External product (including, renewals, maintenance, growth and development) – plant product delivered across the wider Bay of Plenty Region outside of Tauranga City and neighbouring suburbs, as well as product that might leave the region; and

(e)   Component 5 Renewals and Maintenance product within Tauranga – plant product delivered within Tauranga City and other neighbouring suburbs used for renewals and maintenance.

19   I have also made a number of assumptions based on the information provided by Allied Asphalt. The first assumption is that 75% of product produced at the plant is used within Tauranga City and neighbouring suburbs, with the remaining 25% serving the wider Bay of Plenty and out of region market. Of the 75% of product used locally within Tauranga and surrounds, 80% of this is assumed to be for maintenance and renewals purposes, and 20% is for growth and development.

20   Each component of the gravity model is based on the following formula:

$$C_i = \text{n} * \text{f} * \sum \frac{P_j}{D_{ij}^2}$$

C = component being assessed

P = sample population

D = distance in kilometres

n = number of traffic movements

f = vehicle impact factor (1 for light vehicles (**LVs**) and 5.05 for single rigid trucks and 4.8 for truck and trailer units)

i= site

j = suburb or locality

21   In the context of the gravity model, 'population'[6] refers to a number of different factors as follows:

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[6] 'Population' is used in statistical analysis s to identify the overall pool from which a sample is drawn

(a) Component 1 - Employee movements: the number of people living in a suburb or locality;

(b) Component 2 - Inbound Materials: unity (i.e. 1) as inbound materials have a common source;

(c) Component 3 - Tauranga Product: comparative growth by suburb;

(d) Component 4 - External Product: product demand for all areas outside of Tauranga City and surrounding suburbs to larger towns in the wider Bay of Plenty Region (e.g. Rotorua, Whakatane, Taupo) as well as out of region demand; and

(e) Component 5 – Renewals and Maintenance product within Tauranga: the total length of road network in the different suburbs within Tauranga City and surrounding suburbs.

22   I have then summed together the five individual components to identify the site that is the most optimal location from a transportation cost perspective. I have attached the gravity model as **Appendix 1**. The values resulting from the gravity model are therefore a comparative measure of each site, with the absolute values presented not being of key importance.

Traffic Volumes and Vehicle Types

23   The gravity model is based on the typical daily operation of the proposed plant, allowing of market growth over time as expressed by Mr Palmer in his evidence. I consider this to be a reasonable scenario to consider as it represents the expected operation of the plant although I anticipate that there will be variation in the volume of asphalt produced day to day and that there may be occasional periods of more intense activity.

24   Of the five components being considered, I have assumed all employee movements will be made using LVs, with all other traffic movements to and from site being by different types of heavy commercial vehicle (**HCV**).

25   I understand from Mr Palmer that the future typical daily[7] production is expected to be some 900 tonnes of asphalt. At this level of production, I also understand from Mr Palmer that 30 tonne truck and trailer units are typically used to import material to site and that single truck units carrying around 11 tonnes are the typical type of HCV transporting product from site.

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[7] Assessed as a 24-hour period

As such, the typical daily operations as advised by Mr Palmer result in the traffic movements shown in **Table 1**.

Table 1: Typical Operational Two-way Vehicle Movements (900 tonnes per day production)

	Peak Hour Trips	**Daily Trips**
Staff	8	16
Inbound Materials	9	74
Outbound Product	41	166
Total	58	254

26   I have included my calculation of these trip volumes as **Appendix 2**. I note that the peak hour trips for all the different activities do not align. I assess that the busiest hour of site activity would be likely to generate 58vph.

27   Based on data extracted from the MoT database, HCVs have a significantly higher operating cost compared to LVs. I have considered a variety of operating costs such as fuel consumption, tyre costs, repairs and maintenance, road user charges, vehicle certification, and insurance costs.

28   I have assessed the total operating costs of a LV, rigid HCV and truck and trailer HCV as being $0.54/km, $2.70/km, and $2.57/km respectively. As a result, I have applied a weighting factor of 5.05, and 4.80 to rigid HCV and truck and trailer HCV movements in the gravity model respectively. This ensures an appropriate greater weighting to sites that are more efficient for HCV movements.

Component 1: Employee Movements

29   The gravity model's first component considers the existing population of, and distance between, the different residential areas of Tauranga based on LINZ suburb and locality data[8] and the five alternative locations of the asphalt plant. As shown in **Figure 2**, a total of 39 suburbs and localities have been included in the gravity model. This generally aligns with *Map 18: Future Development Strategy-Staging Map* of the SmartGrowth Strategy document, although I note there are some minor variations between the two. Given the low number of employee trips in the overall

[8] LINZ website defines suburbs as an urban area and localities as being a rural area

typical daily traffic generation associated with the activity, the gravity model is not sensitive to these variations.
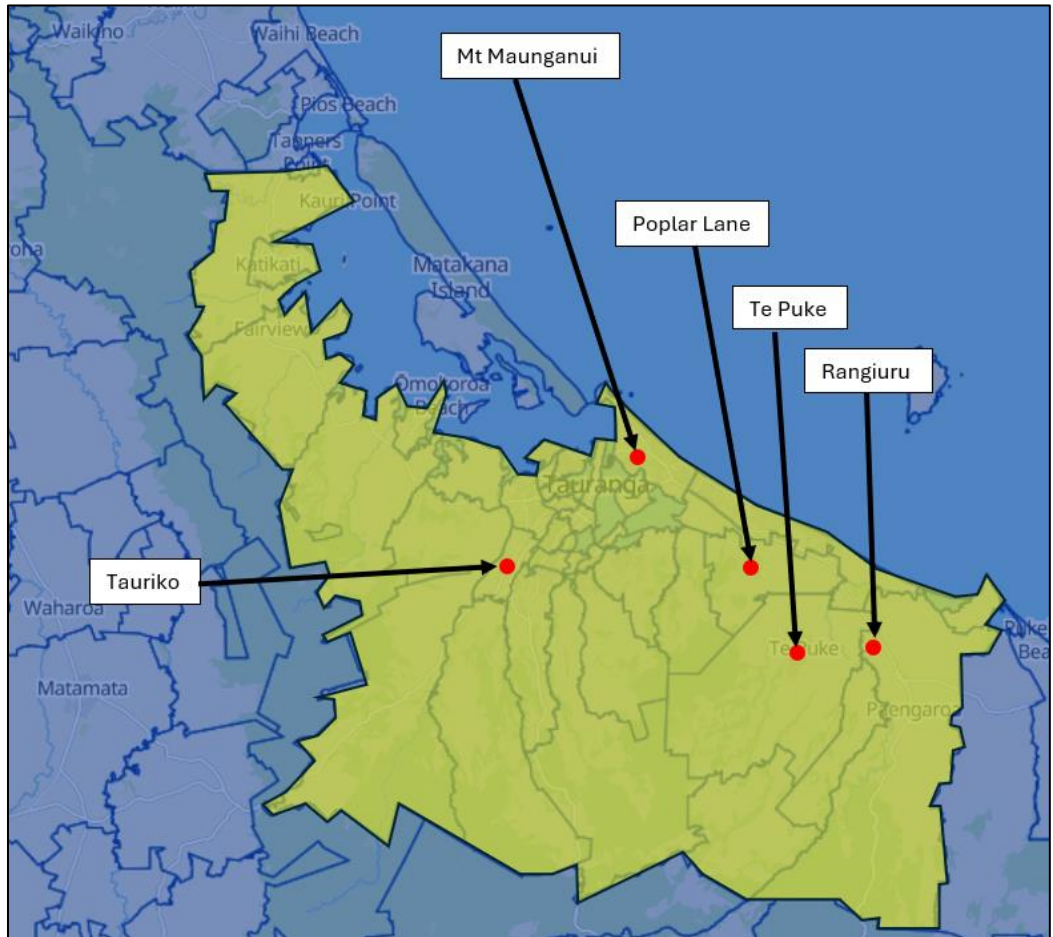
Figure 2: LINZ Suburbs and Localities Included in Gravity Model for Employee Residence Locations

30   I have determined the employee movement component by considering the likelihood of an employee living in any individual suburb or locality, based on the population of each area[9]. I have then considered the distance between the centroid of each suburb area and each alternative site location.

31   The summary of the employee movements score is shown in **Table 2**. Sites with higher scores represent a location that is closer to where employees are likely to originate from.

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[9] LINZ population data is based on information provided by Statistics NZ

Table 2: Employee Movements Score

Possible Alternative Location	Attractiveness Score	Rank
Mount Maunganui	0.2493	1
Poplar Lane	0.1092	3
Te Puke	0.1523	2
Tauriko	0.0944	4
Rangiuru	0.0409	5

32   This assessment is based on there being 8 employees on site and shows that the Mount Maunganui site is best located in terms of staff trips.

Component 2: Inbound Materials Traffic

33   The second component of the gravity model considers the convenience of each alternative plant location for delivery of all raw materials.

34   In terms of raw aggregate deliveries, I understand that once these trucks deliver the raw aggregate material to the site, each truck will travel to the Tauranga Port to be backfilled, and then return towards the Waikato region. I have selected the intersection of State Highway 28 (**SH28**) and State Highway 29 (**SH29**) as the common source point (and corresponding final destination point for these back fill trips) based on my understanding that the majority of raw materials will be arriving from the Waikato region, and returning to the Waikato region. I have also selected the intersection of Maui Street / Totara Street / Waimarie Street as the Tauranga Port location where these trucks will be backfilled. Finally, I have considered the most direct route between this source point, each alternative site, to Tauranga Port, and the final destination point (same as source point) to determine relative differences in total journey length.

35   The summary for the inbound materials traffic is shown in **Table 3**. The site with the highest score represents the optimal location for inbound materials traffic.

Table 3: Inbound Deliveries Score

Possible Alternative Location	Attractiveness Score	Rank
Mount Maunganui	0.0497	2
Poplar Lane	0.0299	3
Te Puke	0.0264	4
Tauriko	0.0524	1
Rangiuru	0.0198	5

36   This shows that the Tauriko site is best located in terms of inbound material trips, with the existing site at Mount Maunganui being second.

Component 3: Tauranga Product (future growth and development)

37   The third component of the gravity model considers the product from the site that will be used within Tauranga City and the neighbouring suburbs in the Western Bay of Plenty subregion for future growth and development.

38   The area I have considered as being within the City is shown in **Figure 3**. This aligns with *Map 18: Future Development Strategy-Staging Map* of the draft SmartGrowth Strategy document shown in **Figure 4**.
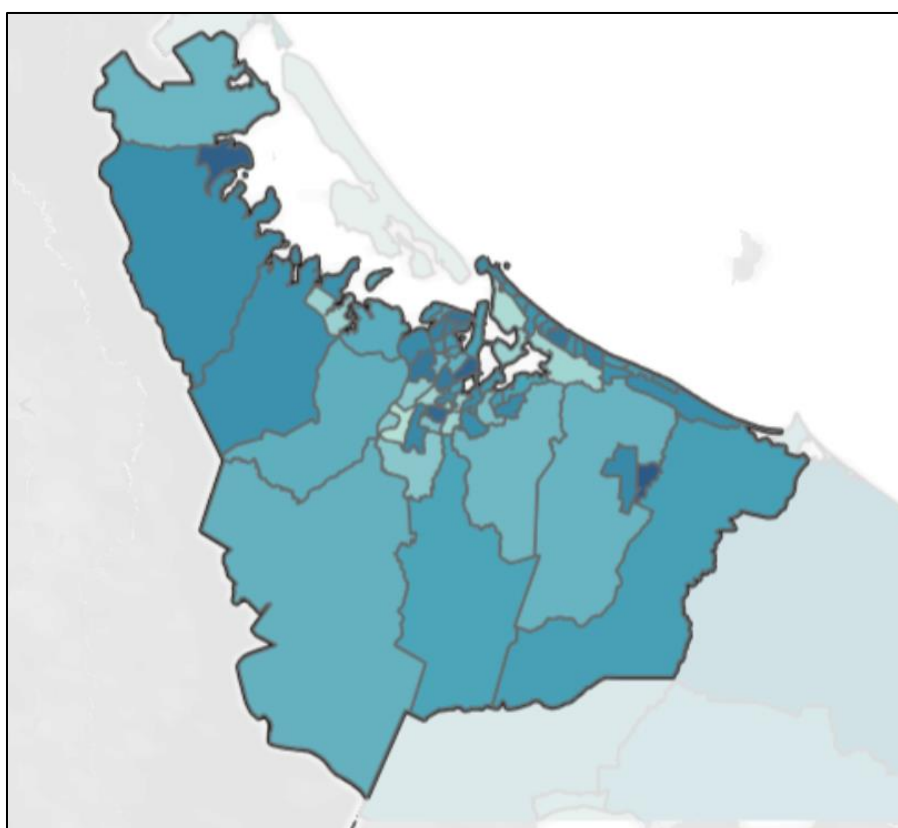
Figure 3: Suburbs Considered in Tauranga Product Component
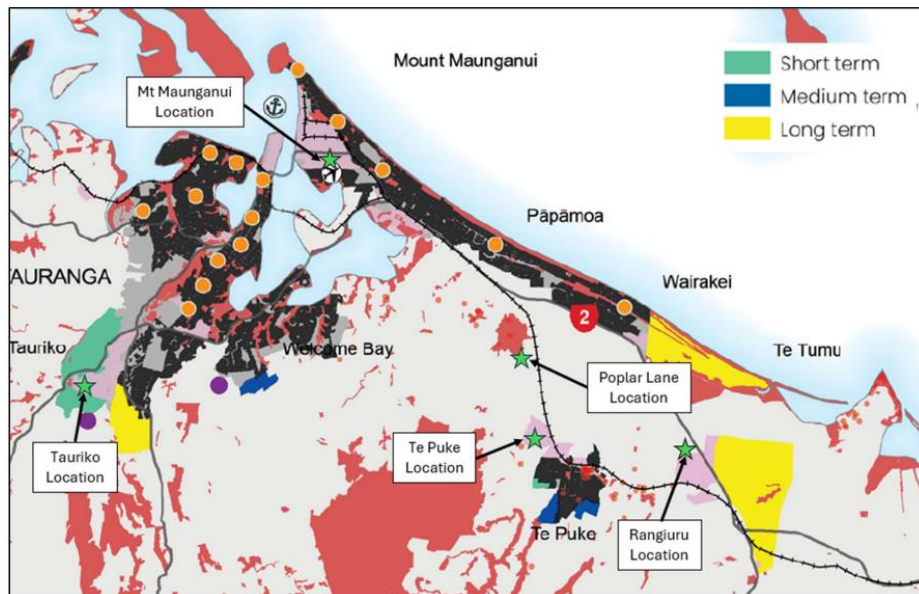
Figure 4: Suburbs with largest anticipated growth according to SmartGrowth database

39   Based on information provided by Mr. Palmer, I understand that some 20% of the total Tauranga product is likely to be used for future growth and development, with the remaining 80% of product used for renewals and maintenance (Component 5). I consider that demand for asphalt used for future growth and development will be greatest in areas with higher expected population growth as road networks are built or upgraded to support these areas. As such, I have considered the number of additional dwellings to be the primary factor when determining demand in different areas. I have based this assessment on the 30-year anticipated growth from SmartGrowth to align with the consent timeframe. It is my understanding that Tauranga Transport Hybrid Model, the TCC Long Term Plan and SmartGrowth are based on a common assessment of where population growth is expected to occur. My assessment is therefore consistent with these growth planning and assessment tools. However, I also note that there is a degree of uncertainty around what is likely to be delivered and where in relation to the SmartGrowth strategy as growth areas are not necessarily appropriately zoned to reflect the intended future use and that infrastructure is also not necessarily funded. Mr Batchelar discusses this in his evidence.

40   The summary for the Tauranga Product (future growth and development) component is shown in **Table 4**. The site with the highest score represents the optimal location for outbound traffic delivering products within Tauranga City.

Table 4: Tauranga Product Score (future growth and development)

Possible Alternative Location	Attractiveness Score	Rank
Mount Maunganui	1.609	2
Poplar Lane	0.654	5
Te Puke	1.427	3
Tauriko	4.598	1
Rangiuru	0.657	4

41   This shows that a site in Tauriko is optimal in terms of outbound product deliveries of product used for future growth and development within the City, with the existing site at Mount Maunganui being second.

Component 4: External Product

42   Based on information received from Allied, I understand that some 25% of total production is expected to serve with wider Bay of Plenty Region and also potentially out of region demand. I have assumed that this demand will travel towards Whakatane, Rotorua, Taupo, Waihi/Coromandel, and Kawerau proportional to population of each centre.

43   The summary for the External Product component is shown in **Table 5**. The site with the highest score represents the optimal location for outbound traffic delivering products outside Tauranga City.

Table 5: External Product Score (future growth and development)

Possible Alternative Location	Attractiveness Score	Rank
Mount Maunganui	0.0285	5
Poplar Lane	0.0301	4
Te Puke	0.0356	2
Tauriko	0.0311	3
Rangiuru	0.0423	1

44   The assessment shows that the Rangiuru site is optimal in terms of outbound product deliveries for External Product, with the existing site ranking last.

Component 5: Renewals and Maintenance Product within Tauranga

45   The fifth component of the gravity model considers the product from the site that will be used within Tauranga City and the neighbouring suburbs for renewal and maintenance purposes. Based on information received from Allied, I understand that 80% of the Tauranga City product is typically used for renewal and maintenance. I consider that demand for asphalt used for renewals and maintenance will be greatest in suburbs with the longest road network. As such, I have considered the total length of the road network in each suburb to be the primary factor when determining demand in different areas. I have based this assessment on the roading network data obtained from the LINZ website[2]. It is my understanding that majority of the asphalt product will be used for roading pavement rehabilitation/resurfacing projects, and the average lifespan of a road is 25 years. My assessment is therefore consistent with the consent timeframe of the asphalt plant. Based on this lifespan, I have not considered renewals and maintenance for growth areas as the new roads provided can reasonably be expected to not need renewals or significant maintenance in that timeframe.

46   The area I have considered for renewals and maintenance product is shown in **Figure 5** below.
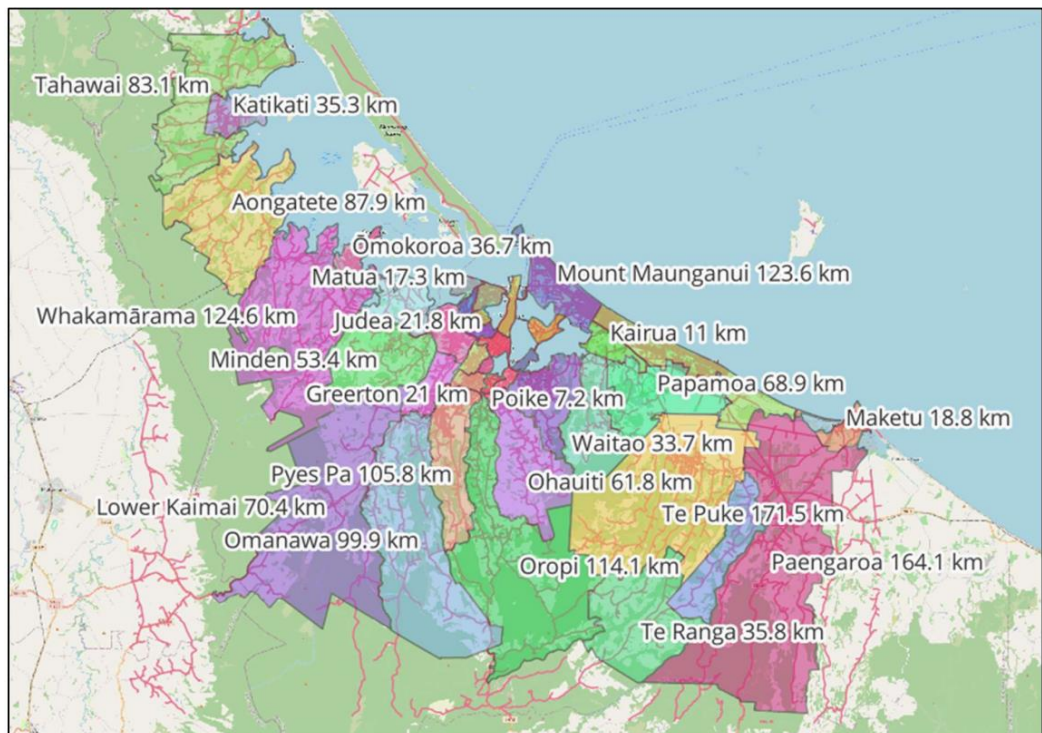
Figure 5: Suburbs with corresponding lengths of the road network

47   The summary for the Renewals and Maintenance Product component is shown in **Table 6**. The site with the highest score represents the optimal

location for outbound traffic delivering products to be used for Renewals and maintenance purposes within Tauranga City.

Table 6: Renewals and Maintenance Product Score

Possible Alternative Location	Attractiveness Score	Rank
Mount Maunganui	4.589	1
Poplar Lane	2.802	4
Te Puke	3.868	2
Tauriko	2.958	3
Rangiuru	2.468	5

48   This shows that the existing site location in Mount Maunganui is optimal in terms of outbound product deliveries of product used for renewals and maintenance purposes.

Combined Results

49   The combined results for the gravity model are shown in **Table 7.** Tauriko has the highest overall score, with the existing site at Mount Maunganui being second.

Table 7: Combined Results

Possible Alternative Location	Employee Movements	Inbound Materials	Tauranga Product – Growth & Development	External Product - Growth & Development	Renewals and Maintenance Product	Total	Rank
Mt Maunganui	0.249	0.0497	1.609	0.0285	4.589	6.526	2
Poplar Lane	0.109	0.0299	0.654	0.0301	2.802	3.625	4
Te Puke	0.152	0.0264	1.427	0.0356	3.868	5.509	3
Tauriko	0.094	0.0524	4.598	0.0311	2.958	7.734	1
Rangiuru	0.041	0.0198	0.657	0.0423	2.468	3.228	5

Sensitivity Analysis

50   As part of the gravity model, a sensitivity analysis has also been completed to assess the impact on the total score and rank for each site following a change in one of the five components. Since the renewals and maintenance product component has the largest impact on the total score, I have chosen to change this component. I have therefore increased the renewals and maintenance product component to represent 90% of the overall Tauranga

City market and have reduced the growth and development product component to 10%. This is on the basis of the uncertainty around SmarthGrowth delivery due to zoning and funding matters.

51   As can be seen from **Table 8**, the outcome of the assessment shows that the Mount Maunganui site would be preferred, with the Tauriko site being second. In my opinion, this demonstrates that there is a degree of sensitivity within the gravity model to the assumptions on the locality in which product is used and for what purpose in relation to whether Mount Mauganui or Tauriko is the preferential site from a transport perspective, however, it does confirm that these locations are preferential compared to the other three location considered.

Table 8: Sensitivity Analysis - Decreased Renewals and maintenance product

Possible Alternative Location	Employee Movements	Inbound Materials	Tauranga Product – Growth & Development	External Product - Growth & Development	Renewals and Maintenance Product	Total	Rank
Mt Maunganui	0.249	0.0497	0.805	0.0285	5.163	6.295	1
Poplar Lane	0.109	0.0299	0.327	0.0301	3.152	3.648	4
Te Puke	0.152	0.0264	0.713	0.0356	4.351	5.279	3
Tauriko	0.094	0.0524	2.299	0.0311	3.328	5.805	2
Rangiuru	0.041	0.0198	0.328	0.0423	2.776	3.208	5

Vehicle Kilometres Travelled

52   I have also calculated the total VKT for each of the five alternative sites as an alternative method of assessment. I have considered all daily employee movements, and the inbound and outbound delivery movements as part of this calculation. In my opinion, the weighting factor is not needed for this part of my overall assessment as this is a straight measure of the relative distance travelled by vehicles going to and from site under typical operating conditions and is not a measure of transport cost.

53   Each component of the VKT assessment is based on the following formula:

$$C_i = \text{n} * \sum P_{ij} * D_{ij}$$

C = component being assessed

P = sample population

D = distance in kilometres between site (i) and suburb or locality (j)

n = number of traffic movements

i= site

j = suburb or locality

54   Results of the VKT calculation are shown in **Table *9*** and demonstrate that locating the plant at its existing location in Mount Maunganui would result in the lowest VKT. This difference is largely arithmetic due to the fact that the gravity model formula divides population by distance squared whereas the VKT assessment multiplies population by distance and in my opinion, highlights the importance of considering the alternative site locations using more than one methodology for robustness.

Table 9: Daily Vehicle Kilometres Travelled (900 tonnes per day production)

Possible Alternative Location	Employee Movements	Inbound Materials	Tauranga Product – Growth & Development	External Product - Growth & Development	Renewals and Maintenance Product	Total	Rank
Mt Maunganui	224.8	6,253.0	364.4	3,930.0	1,954.0	12,726.2	1
Poplar Lane	311.4	8,066.0	504.8	3,918.0	2,306.8	15,106.9	3
Te Puke	350.8	8,584.0	570.8	3,734.1	2,458.1	15,697.8	4
Tauriko	306.7	6,090.2	484.6	3,772.1	2,289.0	12,942.7	2
Rangiuru	504.6	9,916.0	786.4	3,686.7	3,301.0	18,194.7	5

55   In my opinion, developing the asphalt plant at either Tauriko or the existing site at Mount Maunganui would represent the best locations from a transportation cost perspective based on both the gravity model and VKT assessment. The combined analysis clearly shows that the sites at Poplar Lane, Te Puke or Rangiuru are consistently less attractive than the other two sites and in my opinion, are not appropriate to consider further.

Permitted Baseline

56   I have considered the potential traffic generation that could arise from other industrial developments as a permitted baseline. I have used average trip

rates from RR453[10] for the warehousing and manufacturing activities. I have assessed the site area, excluding the Fulton Hogan offices to be approximately 0.7ha in area and have assumed a building site coverage of 50%, resulting in a building footprint of 3,500m^2. The results are presented in Table 10.

Table 10: Permitted Baseline Traffic Generation for Alternative Industrial Activities

Activity	Daily Trip Rate / 100m^2	Daily Traffic Generation (vpd)
Warehousing	2.1	74
Manufacturing	17	595

57   The anticipated day to day site generation of 144vpd for the existing 500 tonne/day production level is within the lower end of the range of traffic generation that could reasonably be expected from site either under a warehousing or manufacturing use. Similarly, the 30-year future day to day operation which I have assessed as generating 256vpd is significantly lower than the potential trip generation if the site were to be used for general manufacturing purposes.

Conclusion

58   In terms of permitted baseline, I assess that the 30-year future plant operation traffic generation is well within the range of expected traffic generation for an industrial site.

59   My gravity model has assessed five possible site locations for the asphalt plant. The site at Mount Maunganui ranks second from a transportation cost perspective, however, ranked first under the sensitivity test analysis. As such, I consider there is a degree of sensitivity within the gravity model to market assumptions, but that overall, either Mount Maunganui or Tauriko would represent preferred location for the future plant.

60   The gravity model results above are based on the 2054 forecasted production values for the Allied Asphalt plant (approximately 900 tonne production per day). However, I have also completed the analysis for the present year (2024) which has a typical production of 500 tonne per day.

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[10] NZTA Research Report 453 'Trips and Parking Related to Land Use' November 2011, Table C.1 New Zealand Trip Generation and Parking Demand

Comparison of these two results showed that the ranking of the five locations remains the same in the current and future scenario.

61 In terms of the alternative VKT assessment, the Mount Maunganui site would represent the preferred location, with the Tauriko location being second.

62 Overall, when considering both gravity model, sensitivity analysis and VKT assessment, I consider that the Mount Maunganui site represents a suitable location for the proposed asphalt plant. I also consider that the Tauriko location could offer a reasonable alternative on transportation grounds.

Judith Makinson
Dated this 26th day of April 2024

Appendix 1 – Gravity Model

Component 1: Employee Movements

Population of each suburb			Distance between suburb and alternative sites				
Suburb	Population	Relative population	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry, Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa,Tauriko	110 Young Road, Rangiuru
Tahawai	2791	1.33%	51.6	63	66	48.7	77.6
Katikati	5572	2.65%	43.5	55.3	57.9	41	69.3
Aongatete	2394	1.14%	37.8	49.2	52.2	35.2	63.6
Whakamarama	4340	2.07%	24	35.4	38.4	21.4	50.1
Omokoroa	4771	2.27%	27.2	40.7	43.7	24.6	53
Te Puna	2383	1.13%	17.8	29.2	32.2	15.3	43.7
Minden	2594	1.23%	18.3	29.8	32.8	15.8	44.2
Bethlehem	9388	4.47%	11.8	23.2	26.2	9.2	37.6
Matua	5441	2.59%	8.9	22.2	25.2	15	34.7
Otumoetai	8787	4.18%	7.1	20.4	23.4	12.9	33
Bellevue	4417	2.10%	9.6	22.9	26.5	12	35.4
Brookfield	5923	2.82%	9.4	22.1	25.1	10.7	36.6
Judea	4262	2.03%	10	23.3	26.3	10	35.8
Tauranga	2973	1.42%	6	19.3	22.3	12.9	31.8
Tauranga South	5799	2.76%	8.4	19	22.2	11.6	33.6
Gate Pa	6837	3.25%	11.7	21.6	24.9	8.1	36.5
Parkvale	3140	1.49%	11.1	20.3	23.5	9.6	34.9
Tauriko	1454	0.69%	15.6	25.2	28.2	6	40.1
Greerton	3552	1.69%	13.1	21.3	24.6	7.4	36.2
Pyes Pa	14963	7.12%	17.6	23.3	26.6	8.7	38.2
Omanawa	2355	1.12%	24	32.7	36	6.9	47.6
Lower Kaimai	878	0.42%	23.8	32.5	35.7	6.7	47.4
Oropi	2750	1.31%	16.1	21.4	24.7	10	36.3
Ohauiti	5200	2.48%	13.2	18.5	21.7	11.2	33.4
Poike	940	0.45%	13.7	18.9	22.2	9.9	33.8
Hairini	3318	1.58%	11.5	16.8	20.1	10.5	31.7
Maungatapu	3032	1.44%	9.7	17	20.3	12	29.9
Welcome Bay	11997	5.71%	14	14.3	17.6	14.1	27.2
Matapihi	746	0.36%	7.3	16.6	19.6	24.3	28.9
Mount Maunganui	23367	11.12%	3.6	11.9	15.1	20.3	24.4
Papamoa Beach	32461	15.45%	8.9	6.8	10.1	26.9	19
Papamoa	2176	1.04%	12.1	5.5	8.8	27.4	20.1
Kairua	485	0.23%	9.4	8.9	12.1	20.4	21.7
Waitao	810	0.39%	17.3	14.5	17.8	22.3	27.4
Te Puke	12537	5.97%	20.4	8.3	3.1	35.6	8.6
Paengaroa	2712	1.29%	27.2	17.9	12.7	42.2	5.1
Maketu	1512	0.72%	33.1	21.8	16.6	48.3	8.9
Rangiuru	441	0.21%	29.3	17.2	12	49.7	10
Te Ranga	585	0.28%	34.4	22.2	17.1	47.9	18.6
TOTAL	**210083**	**100.00%**					

Attractiveness of each location					
Suburb	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry , Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa, Tauriko	110 Young Road, Rangiuru
Tahawai	5E-06	3E-06	3E-06	6E-06	2E-06
Katikati	1E-05	9E-06	8E-06	2E-05	6E-06
Aongatete	8E-06	5E-06	4E-06	9E-06	3E-06
Whakamarama	4E-05	2E-05	1E-05	5E-05	8E-06
Omokoroa	3E-05	1E-05	1E-05	4E-05	8E-06
Te Puna	4E-05	1E-05	1E-05	5E-05	6E-06
Minden	4E-05	1E-05	1E-05	5E-05	6E-06
Bethlehem	3E-04	8E-05	7E-05	5E-04	3E-05
Matua	3E-04	5E-05	4E-05	1E-04	2E-05
Otumoetai	8E-04	1E-04	8E-05	3E-04	4E-05
Bellevue	2E-04	4E-05	3E-05	1E-04	2E-05
Brookfield	3E-04	6E-05	4E-05	2E-04	2E-05
Judea	2E-04	4E-05	3E-05	2E-04	2E-05
Tauranga	4E-04	4E-05	3E-05	9E-05	1E-05
Tauranga South	4E-04	8E-05	6E-05	2E-04	2E-05
Gate Pa	2E-04	7E-05	5E-05	5E-04	2E-05
Parkvale	1E-04	4E-05	3E-05	2E-04	1E-05
Tauriko	3E-05	1E-05	9E-06	2E-04	4E-06
Greerton	1E-04	4E-05	3E-05	3E-04	1E-05
Pyes Pa	2E-04	1E-04	1E-04	9E-04	5E-05
Omanawa	2E-05	1E-05	9E-06	2E-04	5E-06
Lower Kaimai	7E-06	4E-06	3E-06	9E-05	2E-06
Oropi	5E-05	3E-05	2E-05	1E-04	1E-05
Ohauiti	1E-04	7E-05	5E-05	2E-04	2E-05
Poike	2E-05	1E-05	9E-06	5E-05	4E-06
Hairini	1E-04	6E-05	4E-05	1E-04	2E-05
Maungatapu	2E-04	5E-05	4E-05	1E-04	2E-05
Welcome Bay	3E-04	3E-04	2E-04	3E-04	8E-05
Matapihi	7E-05	1E-05	9E-06	6E-06	4E-06
Mount Maunganui	9E-03	8E-04	5E-04	3E-04	2E-04
Papamoa Beach	2E-03	3E-03	2E-03	2E-04	4E-04
Papamoa	7E-05	3E-04	1E-04	1E-05	3E-05
Kairua	3E-05	3E-05	2E-05	6E-06	5E-06
Waitao	1E-05	2E-05	1E-05	8E-06	5E-06
Te Puke	1E-04	9E-04	6E-03	5E-05	8E-04
Paengaroa	2E-05	4E-05	8E-05	7E-06	5E-04
Maketu	7E-06	2E-05	3E-05	3E-06	9E-05
Rangiuru	2E-06	7E-06	1E-05	8E-07	2E-05
Te Ranga	2E-06	6E-06	1E-05	1E-06	8E-06
TOTAL	0.0156	0.0068	0.0095	0.0059	0.0026

Results	
Total Employee Vehicle Movements	16
Site	**Attractiveness Score**
Attractiveness of 54 Aerodrome Road	0.2493
Attractiveness of Poplar Lane Quarry	0.1092
Attractiveness of 576 Te Puke Highway	0.1523
Attractiveness of 70 Belk Road	0.0944
Attractiveness of 110 Young Road	0.0409

Component 2: Inbound Materials Traffic

Operating costs of a regular vehicle:		
Average VOC (incl. fuel, tyres, RnM, oil etc.)	0.240	$/km
FOC (assuming 11,000km/yr)	3247	$/yr
FOC ($/km)	0.295	$/km
Total operating Costs	0.535	$/km

Operating Costs of a truck (ave. of 2, 3 and 4 axle truck)		
Fuel Costs per km (including resource and duty cost)	0.467	$/km
Tyre Cost per km	0.037	$/km
Repairs and maintenance cost per km	0.140	$/km
Road user charges per km	0.173	$/km
Total variable costs per km	0.817	$/km
Fixed costs (average mileage per yr)	1.885	$/km
Total Operating costs	2.702	$/km
Operating cost ratio between Rigid Truck & regular vehicle	5.05	

Operating Costs of a Truck + Trailer		
Fuel Costs per km (including resource and duty cost)	0.790	$/km
Tyre Cost per km	0.110	$/km
Repairs and maintenance cost per km	0.200	$/km
Road user charges per km	0.530	$/km
Total variable costs per km	1.630	$/km
Fixed costs (average mileage per yr)	0.939	$/km
Total Operating costs	2.569	$/km
Operating cost ratio between Truck + Trailer & regular vehicle	4.800	

Distance between SH28/29 intersection to alternative site locations	
Proposed Location	Dist. (km)
Existing Location - 54 aerodrome road	84.5
AA poplar Lane - Poplar Lane Quarry	109
AA Te Puke - 576 te puke highway	116
AA Tauriko - 70 Belk Road	82.3
AA Rangiuru - 110 young road	134

Inbound Truck Movements	
Inbound bitumen and emulsion delivery truck movements	12
Inbound aggregate trucks	62
Total inbound deliveries	74.000

Results	
Existing Location - 54 Aerodrome Road	0.0497
Poplar Lane Quarry, Poplar Lane	0.0299
576 Te Puke Highway, Te Puke	0.0264
70 Belk Road, Omanawa, Tauriko	0.0524
110 Young Road, Rangiuru	0.0198

Component 3: Tauranga Product - Growth and Development

Suburb	Population Increase					Distance between suburb and alternative sites				
	Short term	Medium Term	Long Term	Total	% increase	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry, Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa, Tauriko	110 Young Road, Rangiuru
Tauranga City	1000	3300	8900	13200	35.6%	5.8	19.1	22.3	13.1	31.6
Te Puke	40	75	165	280	0.8%	20.3	8.2	3	35.6	8.6
Omokoroa	40	75	165	280	0.8%	27	40.3	43.6	24.9	52.8
Katikati	80	290	360	730	2.0%	43.4	56.7	60	41.3	69.2
Omokoroa	340	1160	1440	2940	7.9%	27	40.3	43.6	24.9	52.8
Bethlehem	270	890	530	1690	4.6%	11.8	25.1	28.4	9.7	37.6
Papamoa	230	520	170	920	2.5%	8.9	6.8	10.1	27.4	19
Wairakei	500	1380	270	2150	5.8%	16.2	9.8	13.1	32.3	22.7
Te Tumu			4200	4200	11.3%	19.3	9.1	12.3	34.5	21.9
Te Puke	410	2230	10	2650	7.1%	20.3	8.2	3	35.6	8.6
Eastern Centre			800	800	2.2%	26.6	15.5	10.3	42.1	2.6
Pyes Pa	40	140	70	250	0.7%	16.2	24.3	27.6	7.3	36.8
Pyes Pa West	110	180	130	420	1.1%	17.5	28.6	31.8	8.6	41.1
Ohauiti	100	230	120	450	1.2%	11.9	19.6	22.9	10.1	32.1
Welcome Bay	60	110	30	200	0.5%	13.9	14.3	17.6	14.1	27.2
Tauriko West	150	1260	2090	3500	9.4%	16.7	25.4	31.1	1.7	40.3
Ohauiti South		190	280	470	1.3%	14.1	19.3	25	12.1	34.3
Keenan Road			2000	2000	5.4%	19.4	28.7	31.9	10.5	41.2
Total				37130	100.0%					

Suburb	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry , Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa, Tauriko	110 Young Road, Rangiuru
Tauranga City	0.010568	0.000975	0.000715	0.002072	0.000356
Te Puke	0.000018	0.000112	0.000838	0.000006	0.000102
Omokoroa	0.000010	0.000005	0.000004	0.000012	0.000003
Katikati	0.000010	0.000006	0.000005	0.000012	0.000004
Omokoroa	0.000109	0.000049	0.000042	0.000128	0.000028
Bethlehem	0.000327	0.000072	0.000056	0.000484	0.000032
Papamoa	0.000313	0.000536	0.000243	0.000033	0.000069
Wairakei	0.000221	0.000603	0.000337	0.000056	0.000112
Te Tumu	0.000304	0.001366	0.000748	0.000095	0.000236
Te Puke	0.000173	0.001061	0.007930	0.000056	0.000965
Eastern Centre	0.000030	0.000090	0.000203	0.000012	0.003187
Pyes Pa	0.000026	0.000011	0.000009	0.000126	0.000005
Pyes Pa West	0.000037	0.000014	0.000011	0.000153	0.000007
Ohauiti	0.000086	0.000032	0.000023	0.000119	0.000012
Welcome Bay	0.000028	0.000026	0.000017	0.000027	0.000007
Tauriko West	0.000338	0.000146	0.000097	0.032617	0.000058
Ohauiti South	0.000064	0.000034	0.000020	0.000086	0.000011
Keenan Road	0.000143	0.000065	0.000053	0.000489	0.000032
Total	**0.013**	**0.005**	**0.011**	**0.037**	**0.005**

Title: **Attractiveness of each location**

Results	
Total Outbdound Delivery Movements	166
Rigid Delivery Truck to Car Ratio	5.05
Internal Deliveries	75%
Deliveries for Growth and Development product	20%
Site	**Attractiveness Score**
Attractiveness of 54 Aerodrome Road	1.609
Attractiveness of Poplar Lane Quarry	0.654
Attractiveness of 576 Te Puke Highway	1.427
Attractiveness of 70 Belk Road	4.598
Attractiveness of 110 Young Road	0.657

Component 4: External Product (future growth and development)

External Region	Export Percentage	Relative Export Percentage	Distance between suburb and alternative sites				
			Existing Location - 54 Aerodrome Road	Poplar Lane Quarry, Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa, Tauriko	110 Young Road, Rangiuru
Whakatane	6.9%	27.7%	81.7	77.1	67.3	97.1	59.6
Rotorua	5.4%	21.6%	68.5	63	57.8	59.8	51.6
Waikato (Hamilton)	6.7%	26.7%	113	121	124	93.7	136
Waihi	1.7%	6.7%	66.2	79.4	82.7	63.5	91.9
Taupo	2.9%	11.7%	152	147	138	137	129
Kawerau	1.4%	5.7%	87.1	82.6	72.7	103	65.1

Attractiveness of each location					
External Region	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry , Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa Tauriko	110 Young Road, Rangiuru
Whakatane	4.1436E-05	4.6528E-05	6.10649E-05	2.93E-05	7.786E-05
Rotorua	4.6083E-05	5.448E-05	6.47237E-05	6.05E-05	8.121E-05
Waikato (Hamilton)	2.0884E-05	1.8214E-05	1.7343E-05	3.04E-05	1.442E-05
Waihi	1.5212E-05	1.0575E-05	9.7476E-06	1.65E-05	7.894E-06
Taupo	5.0685E-06	5.4191E-06	6.14902E-06	6.24E-06	7.037E-06
Kawerau	7.4809E-06	8.3182E-06	1.07379E-05	5.35E-06	1.339E-05
Total	0.000136	0.000144	0.000170	0.000148	0.000202

Results

Total Outbdound Delivery Movements	166
Rigid Delivery Truck to Car Ratio	5.05
External Deliveries	25%

Site	Attractiveness Score
Attractiveness of 54 Aerodrome Road	0.0285
Attractiveness of Poplar Lane Quarry	0.0301
Attractiveness of 576 Te Puke Highway	0.0356
Attractiveness of 70 Belk Road	0.0311
Attractiveness of 110 Young Road	0.0423

Component 5: Renewals and Maintenance Product

Road Length in each suburb			Distance between suburb and alternative sites				
Suburb	Road Length (km)	Relative Road Length	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry, Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa ,Tauriko	110 Young Road, Rangiuru
Tahawai	83.07	3.86%	51.6	63	66	48.7	77.6
Katikati	35.32	1.64%	43.5	55.3	57.9	41	69.3
Aongatete	87.85	4.08%	37.8	49.2	52.2	35.2	63.6
Whakamarama	124.63	5.79%	24	35.4	38.4	21.4	50.1
Omokoroa	36.73	1.71%	27.2	40.7	43.7	24.6	53
Te Puna	32.51	1.51%	17.8	29.2	32.2	15.3	43.7
Minden	53.37	2.48%	18.3	29.8	32.8	15.8	44.2
Bethlehem	58.66	2.72%	11.8	23.2	26.2	9.2	37.6
Matua	17.33	0.80%	8.9	22.2	25.2	15	34.7
Otumoetai	29.38	1.36%	7.1	20.4	23.4	12.9	33
Bellevue	11.15	0.52%	9.6	22.9	26.5	12	35.4
Brookfield	17.43	0.81%	9.4	22.1	25.1	10.7	36.6
Judea	21.85	1.01%	10	23.3	26.3	10	35.8
Tauranga	37.66	1.75%	6	19.3	22.3	12.9	31.8
Tauranga South	27.59	1.28%	8.4	19	22.2	11.6	33.6
Gate Pa	24.06	1.12%	11.7	21.6	24.9	8.1	36.5
Parkvale	8.03	0.37%	11.1	20.3	23.5	9.6	34.9
Tauriko	30.38	1.41%	15.6	25.2	28.2	6	40.1
Greerton	21.00	0.98%	13.1	21.3	24.6	7.4	36.2
Pyes Pa	105.83	4.91%	17.6	23.3	26.6	8.7	38.2
Omanawa	99.95	4.64%	24	32.7	36	6.9	47.6
Lower Kaimai	70.39	3.27%	23.8	32.5	35.7	6.7	47.4
Oropi	114.07	5.30%	16.1	21.4	24.7	10	36.3
Ohauiti	61.82	2.87%	13.2	18.5	21.7	11.2	33.4
Poike	7.23	0.34%	13.7	18.9	22.2	9.9	33.8
Hairini	16.86	0.78%	11.5	16.8	20.1	10.5	31.7
Maungatapu	12.55	0.58%	9.7	17	20.3	12	29.9
Welcome Bay	68.66	3.19%	14	14.3	17.6	14.1	27.2
Matapihi	11.62	0.54%	7.3	16.6	19.6	24.3	28.9
Mount Maunganui	123.59	5.74%	3.6	11.9	15.1	20.3	24.4
Papamoa Beach	166.64	7.74%	8.9	6.8	10.1	26.9	19
Papamoa	68.91	3.20%	12.1	5.5	8.8	27.4	20.1
Kairua	11.05	0.51%	9.4	8.9	12.1	20.4	21.7
Waitao	33.66	1.56%	17.3	14.5	17.8	22.3	27.4
Te Puke	171.47	7.96%	20.4	8.3	3.1	35.6	8.6
Paengaroa	164.06	7.62%	27.2	17.9	12.7	42.2	5.1
Maketu	18.77	0.87%	33.1	21.8	16.6	48.3	8.9
Rangiuru	32.69	1.52%	29.3	17.2	12	49.7	10
Te Ranga	35.76	1.66%	34.4	22.2	17.1	47.9	18.6
	2153.6	100.00%					

Suburb	Existing Location - 54 Aerodrome Road	Poplar Lane Quarry , Poplar Lane	576 Te Puke Highway, Te Puke	70 Belk Road, Omanawa, Tauriko	110 Young Road, Rangiuru
Attractiveness of each location					
Tahawai	1.45E-05	9.72E-06	8.86E-06	1.63E-05	6.41E-06
Katikati	8.67E-06	5.36E-06	4.89E-06	9.76E-06	3.42E-06
Aongatete	2.86E-05	1.69E-05	1.5E-05	3.29E-05	1.01E-05
Whakamarama	0.0001	4.62E-05	3.92E-05	0.000126	2.31E-05
Omokoroa	2.31E-05	1.03E-05	8.93E-06	2.82E-05	6.07E-06
Te Puna	4.76E-05	1.77E-05	1.46E-05	6.45E-05	7.91E-06
Minden	7.4E-05	2.79E-05	2.3E-05	9.93E-05	1.27E-05
Bethlehem	0.000196	5.06E-05	3.97E-05	0.000322	1.93E-05
Matua	0.000102	1.63E-05	1.27E-05	3.58E-05	6.68E-06
Otumoetai	0.000271	3.28E-05	2.49E-05	8.2E-05	1.25E-05
Bellevue	5.62E-05	9.87E-06	7.37E-06	3.6E-05	4.13E-06
Brookfield	9.16E-05	1.66E-05	1.28E-05	7.07E-05	6.04E-06
Judea	0.000101	1.87E-05	1.47E-05	0.000101	7.91E-06
Tauranga	0.000486	4.69E-05	3.52E-05	0.000105	1.73E-05
Tauranga South	0.000182	3.55E-05	2.6E-05	9.52E-05	1.13E-05
Gate Pa	8.16E-05	2.39E-05	1.8E-05	0.00017	8.39E-06
Parkvale	3.02E-05	9.04E-06	6.75E-06	4.04E-05	3.06E-06
Tauriko	5.8E-05	2.22E-05	1.77E-05	0.000392	8.77E-06
Greerton	5.68E-05	2.15E-05	1.61E-05	0.000178	7.44E-06
Pyes Pa	0.000159	9.05E-05	6.95E-05	0.000649	3.37E-05
Omanawa	8.06E-05	4.34E-05	3.58E-05	0.000975	2.05E-05
Lower Kaimai	5.77E-05	3.09E-05	2.56E-05	0.000728	1.45E-05
Oropi	0.000204	0.000116	8.68E-05	0.00053	4.02E-05
Ohauiti	0.000165	8.39E-05	6.1E-05	0.000229	2.57E-05
Poike	1.79E-05	9.39E-06	6.81E-06	3.42E-05	2.94E-06
Hairini	5.92E-05	2.77E-05	1.94E-05	7.1E-05	7.79E-06
Maungatapu	6.19E-05	2.02E-05	1.41E-05	4.05E-05	6.52E-06
Welcome Bay	0.000163	0.000156	0.000103	0.00016	4.31E-05
Matapihi	0.000101	1.96E-05	1.41E-05	9.14E-06	6.46E-06
Mount Maunganui	0.004428	0.000405	0.000252	0.000139	9.64E-05
Papamoa Beach	0.000977	0.001673	0.000759	0.000107	0.000214
Papamoa	0.000219	0.001058	0.000413	4.26E-05	7.92E-05
Kairua	5.81E-05	6.48E-05	3.5E-05	1.23E-05	1.09E-05
Waitao	5.22E-05	7.43E-05	4.93E-05	3.14E-05	2.08E-05
Te Puke	0.000174	0.000921	0.004737	5.94E-05	0.000864
Paengaroa	0.000103	0.000238	0.000472	4.28E-05	0.002929
Maketu	7.95E-06	1.83E-05	3.16E-05	3.74E-06	0.00011
Rangiuru	1.77E-05	5.13E-05	0.000105	6.14E-06	0.000152
Te Ranga	1.4E-05	3.37E-05	5.68E-05	7.24E-06	4.8E-05
Total	**0.009127**	**0.005572**	**0.007693**	**0.005884**	**0.004908**

Results

Total Outbdound Delivery Movements	166
Rigid Delivery Truck to Car Ratio	5.05
Internal Deliveries	75%
Deliveries for Repair and Maintenance	80%

Site	Attractiveness Score
Attractiveness of 54 Aerodrome Road	4.589
Attractiveness of Poplar Lane Quarry	2.802
Attractiveness of 576 Te Puke Highway	3.868
Attractiveness of 70 Belk Road	2.958
Attractiveness of 110 Young Road	2.468

VKT - Component 1

Population of each suburb			Distance between suburb and alternative sites				
Suburb	Population	Relative Population	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Tahawai	2791	1.3%	51.6	63	66	48.7	77.6
Katikati	5572	2.7%	43.5	55.3	57.9	41	69.3
Aongatete	2394	1.1%	37.8	49.2	52.2	35.2	63.6
Whakamarama	4340	2.1%	24	35.4	38.4	21.4	50.1
Omokoroa	4771	2.3%	27.2	40.7	43.7	24.6	53
Te Puna	2383	1.1%	17.8	29.2	32.2	15.3	43.7
Minden	2594	1.2%	18.3	29.8	32.8	15.8	44.2
Bethlehem	9388	4.5%	11.8	23.2	26.2	9.2	37.6
Matua	5441	2.6%	8.9	22.2	25.2	15	34.7
Otumoetai	8787	4.2%	7.1	20.4	23.4	12.9	33
Bellevue	4417	2.1%	9.6	22.9	26.5	12	35.4
Brookfield	5923	2.8%	9.4	22.1	25.1	10.7	36.6
Judea	4262	2.0%	10	23.3	26.3	10	35.8
Tauranga	2973	1.4%	6	19.3	22.3	12.9	31.8
Tauranga South	5799	2.8%	8.4	19	22.2	11.6	33.6
Gate Pa	6837	3.3%	11.7	21.6	24.9	8.1	36.5
Parkvale	3140	1.5%	11.1	20.3	23.5	9.6	34.9
Tauriko	1454	0.7%	15.6	25.2	28.2	6	40.1
Greerton	3552	1.7%	13.1	21.3	24.6	7.4	36.2
Pyes Pa	14963	7.1%	17.6	23.3	26.6	8.7	38.2
Omanawa	2355	1.1%	24	32.7	36	6.9	47.6
Lower Kaimai	878	0.4%	23.8	32.5	35.7	6.7	47.4
Oropi	2750	1.3%	16.1	21.4	24.7	10	36.3
Ohauiti	5200	2.5%	13.2	18.5	21.7	11.2	33.4
Poike	940	0.4%	13.7	18.9	22.2	9.9	33.8
Hairini	3318	1.6%	11.5	16.8	20.1	10.5	31.7
Maungatapu	3032	1.4%	9.7	17	20.3	12	29.9
Welcome Bay	11997	5.7%	14	14.3	17.6	14.1	27.2
Matapihi	746	0.4%	7.3	16.6	19.6	24.3	28.9
Mount Maunganui	23367	11.1%	3.6	11.9	15.1	20.3	24.4
Papamoa Beach	32461	15.5%	8.9	6.8	10.1	26.9	19
Papamoa	2176	1.0%	12.1	5.5	8.8	27.4	20.1
Kairua	485	0.2%	9.4	8.9	12.1	20.4	21.7
Waitao	810	0.4%	17.3	14.5	17.8	22.3	27.4
Te Puke	12537	6.0%	20.4	8.3	3.1	35.6	8.6
Paengaroa	2712	1.3%	27.2	17.9	12.7	42.2	5.1
Maketu	1512	0.7%	33.1	21.8	16.6	48.3	8.9
Rangiuru	441	0.2%	29.3	17.2	12	49.7	10
Te Ranga	585	0.3%	34.4	22.2	17.1	47.9	18.6
Total	210083	100%					

Suburb	Population percentage * Distance				
	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Tahawai	0.69	0.84	0.88	0.65	1.03
Katikati	1.15	1.47	1.54	1.09	1.84
Aongatete	0.43	0.56	0.59	0.40	0.72
Whakamarama	0.50	0.73	0.79	0.44	1.03
Omokoroa	0.62	0.92	0.99	0.56	1.20
Te Puna	0.20	0.33	0.37	0.17	0.50
Minden	0.23	0.37	0.40	0.20	0.55
Bethlehem	0.53	1.04	1.17	0.41	1.68
Matua	0.23	0.57	0.65	0.39	0.90
Otumoetai	0.30	0.85	0.98	0.54	1.38
Bellevue	0.20	0.48	0.56	0.25	0.74
Brookfield	0.27	0.62	0.71	0.30	1.03
Judea	0.20	0.47	0.53	0.20	0.73
Tauranga	0.08	0.27	0.32	0.18	0.45
Tauranga South	0.23	0.52	0.61	0.32	0.93
Gate Pa	0.38	0.70	0.81	0.26	1.19
Parkvale	0.17	0.30	0.35	0.14	0.52
Tauriko	0.11	0.17	0.20	0.04	0.28
Greerton	0.22	0.36	0.42	0.13	0.61
Pyes Pa	1.25	1.66	1.89	0.62	2.72
Omanawa	0.27	0.37	0.40	0.08	0.53
Lower Kaimai	0.10	0.14	0.15	0.03	0.20
Oropi	0.21	0.28	0.32	0.13	0.48
Ohauiti	0.33	0.46	0.54	0.28	0.83
Poike	0.06	0.08	0.10	0.04	0.15
Hairini	0.18	0.27	0.32	0.17	0.50
Maungatapu	0.14	0.25	0.29	0.17	0.43
Welcome Bay	0.80	0.82	1.01	0.81	1.55
Matapihi	0.03	0.06	0.07	0.09	0.10
Mount Maunganui	0.40	1.32	1.68	2.26	2.71
Papamoa Beach	1.38	1.05	1.56	4.16	2.94
Papamoa	0.13	0.06	0.09	0.28	0.21
Kairua	0.02	0.02	0.03	0.05	0.05
Waitao	0.07	0.06	0.07	0.09	0.11
Te Puke	1.22	0.50	0.18	2.12	0.51
Paengaroa	0.35	0.23	0.16	0.54	0.07
Maketu	0.24	0.16	0.12	0.35	0.06
Rangiuru	0.06	0.04	0.03	0.10	0.02
Te Ranga	0.10	0.06	0.05	0.13	0.05
Total	**14.05**	**19.46**	**21.93**	**19.17**	**31.54**

VKT - Component 1 Results

Total Employee Vehicle Movements	16
Site	**VKT**
54 Aerodrome Road	224.8
Poplar Lane Quarry	311.4
576 Te Puke Highway	350.8
70 Belk Road	306.7
110 Young Road	504.6

VKT - Component 2

Distance between SH28/29 intersection to alternative site locations

Proposed Location	Dist. (km)
Existing Location - 54 Aerodrome Road	84.5
AA poplar Lane - Poplar Lane Quarry	109
AA Te Puke - 576 Te Puke Highway	116
AA Tauriko - 70 Belk Road	82.3
AA Rangiuru - 110 Young Road	134

Inbound Truck Movements

Inbound bitumen and emulsion delivery trucks	12
Inbound aggregate trucks	62
Total inbound deliveries	74.000

VKT - Component 2 Results

Site	VKT
Existing Location - 54 Aerodrome Road	6253.0
Poplar Lane Quarry, Poplar Lane	8066.0
576 Te Puke Highway, Te Puke	8584.0
70 Belk Road, Omanawa, Tauriko	6090.2
110 Young Road, Rangiuru	9916.0

VKT - Component 3

Population of each suburb		Distance between suburb and alternative sites				
Suburb	**Relative Population Increase**	**Existing Location - 54 Aerodrome Road**	**AA poplar Lane - Poplar Lane Quarry**	**AA Te Puke - 576 Te Puke Highway**	**AA Tauriko - 70 Belk Road**	**AA Rangiuru - 110 Young Road**
Tauranga City	35.6%	5.8	19.1	22.3	13.1	31.6
Te Puke	0.8%	20.3	8.2	3	35.6	8.6
Omokoroa	0.8%	27	40.3	43.6	24.9	52.8
Katikati	2.0%	43.4	56.7	60	41.3	69.2
Omokoroa	7.9%	27	40.3	43.6	24.9	52.8
Bethlehem	4.6%	11.8	25.1	28.4	9.7	37.6
Papamoa	2.5%	8.9	6.8	10.1	27.4	19
Wairakei	5.8%	16.2	9.8	13.1	32.3	22.7
Te Tumu	11.3%	19.3	9.1	12.3	34.5	21.9
Te Puke	7.1%	20.3	8.2	3	35.6	8.6
Eastern Centre	2.2%	26.6	15.5	10.3	42.1	2.6
Pyes Pa	0.7%	16.2	24.3	27.6	7.3	36.8
Pyes Pa West	1.1%	17.5	28.6	31.8	8.6	41.1
Ohauiti	1.2%	11.9	19.6	22.9	10.1	32.1
Welcome Bay	0.5%	13.9	14.3	17.6	14.1	27.2
Tauriko West	9.4%	16.7	25.4	31.1	1.7	40.3
Ohauiti South	1.3%	14.1	19.3	25	12.1	34.3
Keenan Road	5.4%	19.4	28.7	31.9	10.5	41.2

Population percentage * Distance					
Suburb	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Tahawai	2.062	6.790	7.928	4.657	11.234
Aongatete	0.153	0.062	0.023	0.268	0.065
Whakamarama	0.204	0.304	0.329	0.188	0.398
Te Puna	0.853	1.115	1.180	0.812	1.361
Minden	2.138	3.191	3.452	1.972	4.181
Matua	0.537	1.142	1.293	0.442	1.711
Bellevue	0.221	0.168	0.250	0.679	0.471
Brookfield	0.938	0.567	0.759	1.870	1.314
Judea	2.183	1.029	1.391	3.903	2.477
Tauranga	1.449	0.585	0.214	2.541	0.614
Tauranga South	0.573	0.334	0.222	0.907	0.056
Parkvale	0.109	0.164	0.186	0.049	0.248
Tauriko	0.198	0.324	0.360	0.097	0.465
Greerton	0.144	0.238	0.278	0.122	0.389
Pyes Pa	0.075	0.077	0.095	0.076	0.147
Omanawa	1.574	2.394	2.932	0.160	3.799
Lower Kaimai	0.178	0.244	0.316	0.153	0.434
Oropi	1.045	1.546	1.718	0.566	2.219
Total VKT	14.634	20.275	22.924	19.462	31.582

VKT - Component 3 Results	
Total Outbdound Delivery Movements	166
Internal Deliveries	75%
Deliveries for Growth and Development product	20%
Site	VKT
54 Aerodrome Road	364.4
Poplar Lane Quarry	504.8
576 Te Puke Highway	570.8
70 Belk Road	484.6
110 Young Road	786.4

VKT - Component 4

	Export Percentages		Distance between suburb and alternative sites				
Suburb	Export Percentage	Relative Export Percentage	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Whakatane	6.9%	27.7%	81.7	77.1	67.3	97.1	59.6
Rotorua	5.4%	21.6%	68.5	63	57.8	59.8	51.6
Waikato (Hamilton)	6.7%	26.7%	113	121	124	93.7	136
Waihi	1.7%	6.7%	66.2	79.4	82.7	63.5	91.9
Taupo	2.9%	11.7%	152	147	138	137	129
Kawerau	1.4%	5.7%	87.1	82.6	72.7	103	65.1

Export Percentage * Distance between suburb and alternative sites					
Suburb	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Whakatane	22.60	21.32	18.61	26.86	16.48
Rotorua	14.81	13.62	12.50	12.93	11.16
Waikato (Hamilton)	30.13	32.27	33.07	24.99	36.27
Waihi	4.41	5.29	5.51	4.23	6.13
Taupo	17.80	17.21	16.16	16.04	15.11
Kawerau	4.94	4.69	4.13	5.85	3.69
Total	94.70	94.41	89.98	90.90	88.84

VKT - Component 4 Results

Site	VKT
Total Outbdound Delivery Movements	166
External Deliveries	25%
54 Aerodrome Road	3930.0
Poplar Lane Quarry	3918.0
576 Te Puke Highway	3734.1
70 Belk Road	3772.1
110 Young Road	3686.7

VKT - Component 5

Population of each suburb			Distance between suburb and alternative sites				
Suburb	Road Length (km)	Relative Road Length	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Tahawai	83.07	3.857%	51.6	63	66	48.7	77.6
Katikati	35.32	1.640%	43.5	55.3	57.9	41	69.3
Aongatete	87.85	4.079%	37.8	49.2	52.2	35.2	63.6
Whakamarama	124.63	5.787%	24	35.4	38.4	21.4	50.1
Omokoroa	36.73	1.705%	27.2	40.7	43.7	24.6	53
Te Puna	32.51	1.510%	17.8	29.2	32.2	15.3	43.7
Minden	53.37	2.478%	18.3	29.8	32.8	15.8	44.2
Bethlehem	58.66	2.724%	11.8	23.2	26.2	9.2	37.6
Matua	17.33	0.805%	8.9	22.2	25.2	15	34.7
Otumoetai	29.38	1.364%	7.1	20.4	23.4	12.9	33
Bellevue	11.15	0.518%	9.6	22.9	26.5	12	35.4
Brookfield	17.43	0.809%	9.4	22.1	25.1	10.7	36.6
Judea	21.85	1.014%	10	23.3	26.3	10	35.8
Tauranga	37.66	1.749%	6	19.3	22.3	12.9	31.8
Tauranga South	27.59	1.281%	8.4	19	22.2	11.6	33.6
Gate Pa	24.06	1.117%	11.7	21.6	24.9	8.1	36.5
Parkvale	8.03	0.373%	11.1	20.3	23.5	9.6	34.9
Tauriko	30.38	1.411%	15.6	25.2	28.2	6	40.1
Greerton	21.00	0.975%	13.1	21.3	24.6	7.4	36.2
Pyes Pa	105.83	4.914%	17.6	23.3	26.6	8.7	38.2
Omanawa	99.95	4.641%	24	32.7	36	6.9	47.6
Lower Kaimai	70.39	3.269%	23.8	32.5	35.7	6.7	47.4
Oropi	114.07	5.297%	16.1	21.4	24.7	10	36.3
Ohauiti	61.82	2.871%	13.2	18.5	21.7	11.2	33.4
Poike	7.23	0.335%	13.7	18.9	22.2	9.9	33.8
Hairini	16.86	0.783%	11.5	16.8	20.1	10.5	31.7
Maungatapu	12.55	0.583%	9.7	17	20.3	12	29.9
Welcome Bay	68.66	3.188%	14	14.3	17.6	14.1	27.2
Matapihi	11.62	0.540%	7.3	16.6	19.6	24.3	28.9
Mount Maunganui	123.59	5.739%	3.6	11.9	15.1	20.3	24.4
Papamoa Beach	166.64	7.738%	8.9	6.8	10.1	26.9	19
Papamoa	68.91	3.200%	12.1	5.5	8.8	27.4	20.1
Kairua	11.05	0.513%	9.4	8.9	12.1	20.4	21.7
Waitao	33.66	1.563%	17.3	14.5	17.8	22.3	27.4
Te Puke	171.47	7.962%	21.4	9.3	4.1	36.6	9.6
Paengaroa	164.06	7.618%	27.2	17.9	12.7	42.2	5.1
Maketu	18.77	0.871%	33.1	21.8	16.6	48.3	8.9
Rangiuru	32.69	1.518%	29.3	17.2	12	49.7	10
Te Ranga	35.76	1.661%	34.4	22.2	17.1	47.9	18.6
Total	2153.6	100.00%					

Suburb	Existing Location - 54 Aerodrome Road	AA poplar Lane - Poplar Lane Quarry	AA Te Puke - 576 Te Puke Highway	AA Tauriko - 70 Belk Road	AA Rangiuru - 110 Young Road
Population percentage * Distance					
Tahawai	1.990396	2.430135	2.545856	1.878533	2.993309
Katikati	0.71349	0.907035	0.94968	0.672485	1.136664
Aongatete	1.542029	2.007085	2.129468	1.435963	2.594525
Whakamarama	1.38894	2.048687	2.222304	1.238472	2.899413
Omokoroa	0.46388	0.694115	0.745278	0.419539	0.903884
Te Puna	0.268726	0.440832	0.486123	0.230984	0.659738
Minden	0.453508	0.7385	0.812846	0.391554	1.095359
Bethlehem	0.321413	0.631931	0.713646	0.250593	1.024164
Matua	0.071634	0.178683	0.20283	0.120732	0.279293
Otumoetai	0.09685	0.278272	0.319195	0.175966	0.450147
Bellevue	0.049699	0.118552	0.137189	0.062123	0.183263
Brookfield	0.076059	0.178821	0.203095	0.086578	0.296146
Judea	0.101439	0.236352	0.266784	0.101439	0.363151
Tauranga	0.10493	0.337525	0.38999	0.2256	0.556129
Tauranga South	0.1076	0.243382	0.284372	0.148591	0.430401
Gate Pa	0.130721	0.241331	0.278201	0.090499	0.407805
Parkvale	0.04137	0.075658	0.087584	0.035779	0.130072
Tauriko	0.220043	0.355454	0.39777	0.084632	0.565623
Greerton	0.127752	0.20772	0.239901	0.072165	0.353026
Pyes Pa	0.864896	1.145005	1.307173	0.427534	1.877218
Omanawa	1.113807	1.517562	1.670711	0.32022	2.209051
Lower Kaimai	0.777935	1.062307	1.166903	0.218999	1.549333
Oropi	0.852805	1.133542	1.308341	0.529693	1.922784
Ohauiti	0.37891	0.531048	0.622905	0.321499	0.958757
Poike	0.045963	0.063408	0.074479	0.033214	0.113397
Hairini	0.090023	0.131512	0.157345	0.082195	0.248151
Maungatapu	0.056532	0.099077	0.118309	0.069936	0.174258
Welcome Bay	0.446312	0.455876	0.561078	0.4495	0.86712
Matapihi	0.039403	0.089601	0.105795	0.131164	0.155993
Mount Maunganui	0.206605	0.682944	0.866593	1.165022	1.400322
Papamoa Beach	0.688668	0.526173	0.781522	2.08148	1.47019
Papamoa	0.387166	0.175985	0.281575	0.876724	0.643144
Kairua	0.04822	0.045655	0.06207	0.104647	0.111316
Waitao	0.270434	0.226664	0.27825	0.348594	0.428318
Te Puke	1.703918	0.740488	0.326452	2.914177	0.764374
Paengaroa	2.072144	1.363653	0.967508	3.21487	0.388527
Maketu	0.288415	0.189953	0.144643	0.42086	0.07755
Rangiuru	0.444696	0.26105	0.182128	0.754313	0.151773
Te Ranga	0.57127	0.368668	0.283974	0.79546	0.308884
Total	**19.62**	**23.16**	**24.68**	**22.98**	**33.14**

VKT - Component 5 Results	
Total Outbdound Delivery Movements	166
Internal Deliveries	75%
Deliveries for Renewals and Maintenance	80%
Site	**VKT**
54 Aerodrome Road	1954.0
Poplar Lane Quarry	2306.8
576 Te Puke Highway	2458.1
70 Belk Road	2289.0
110 Young Road	3301.0

Appendix 2 - Trip Calculations

BAU / Typical Present Day (500 Tonnes of production):

Employee movements:

Night shift – 3 staff working 6pm – 3am

Day shift – 4 staff working 7am – 4pm

All employee movements are expected to be made using light vehicles only.

Total employee vehicle movements: 14 vpd and 4vph as day shift arrives or leaves prior to and after completing their shift

Inbound materials:

Inbound materials are delivered during day shift only (7am – 4pm), to supply both day and night shift production

500T aggregate imported in 30T truck and trailer load (17 loads per day)

2 loads of bitumen daily

1 other load allowed for (lime, refuse, sweeper, maintenance etc)

Total inbound material trips on a typical production day: 40vpd and 5vph

Outbound product:

There is an approximately 1-hour lag between the start of a shift and product being available for delivery.   50% of product is typically delivered in the first two house of production, with the remaining 50% being exported across remainder of shift.

500T asphalt exported in 11T truck loads (45 loads)

Total outbound trips on a typical production day: 90vpd and 23vph in busiest hour

BAU / Typical 30-Year Future Day (900 Tonnes of production):

All trips have been increased by 80% to allow estimated growth in production.

Employee movements:

Night shift – 4 staff working 6pm – 3am

Day shift – 4 staff working 7am – 4pm

All employee movements are expected to be made using light vehicles only.

Total employee vehicle movements: 16vpd and 8vph as day shift arrives or leaves prior to and after completing their shift

Inbound materials:

Inbound materials are delivered during day shift only (7am – 4pm), to supply both day and night shift production

905T aggregate imported in 30T truck and trailer load (31 loads per day)

4 loads of bitumen daily

2 other loads allowed for (lime, refuse, sweeper, maintenance etc)

Total inbound material trips on a typical production day: 74vpd and 9vph

Outbound product:

There is an approximately 1-hour lag between the start of a shift and product being available for delivery.   50% of product is typically delivered in the first two house of production, with the remaining 50% being exported across remainder of shift.

905T asphalt exported in 11T truck loads (83 loads)

Total outbound trips on a typical production day: 166vpd and 41vph in busiest hour

Traffic movements on a 3500-tonne peak day:

Employee movements:

Night shift – 4 staff working 6pm – 5am

Day shift – 4 staff working 7am – 6pm

All employee movements are expected to be made using light vehicles only.

Total employee vehicle movements: 16 vpd and 8vph during shift changeover.

Inbound materials:

If the site is operating at maximum capacity, increased inbound materials deliveries will begin occurring up to 2 days before to the peak day.

Max yard can handle is some 1,500T per day. Assuming 2 days prior stockpiling at 1,000T and 1,500T inbound aggregate on day of production

- 2 days prior at 1,000T aggregate imported between 7am – 4pm, 30T truck and trailer load (34 loads per day)
- Production day @ 1,500T aggregate imported constantly over 22 hours, 30T truck and trailer loads (50 loads)
- 7 loads of bitumen deliveries on production day
- 2 other loads allowed for (lime, refuse, sweeper, maintenance etc) on production day

Total inbound material trips on each of 2 days prior to peak production day: 68vpd and 9vph additional to normal production on those days

Total inbound material trips on peak production day: 118vpd and 5vph on the basis that deliveries will occur over the entire 22hour period

Outbound product:

It has been assumed that there will be a one hour lag between start of shift and first outbound product delivery. It has also been assumed that outbound delivery across 20 hrs will occur at a constant rate.

There is an approximately 1-hour lag between the start of a shift and product being available for delivery.   On peak production days, export of product is expected to occur evenly over a 20 -hour period. Deliveries assumed to be made

using a combination of smaller rigid trucks (12-tonne capacity) and larger truck and trailer units (18-tonne capacity). As such, the average truck capacity has been determined as 15-tonnes.

3,500T asphalt exported in 15T loads (234 loads)

As such, the 234 truck deliveries will result in a total of 468vpd. These deliveries will occur over the entire 22-hour period, hence peak hourly vehicle flow is 23vph.

Total outbound trips on a typical production day: 468vpd and 24vph in busiest hour