1. PURPOSE

The purpose of this note is to document the revised procedure followed to calculate the various category curves used in converting average zonal persons, employed persons and vehicles into the various household categories used in the model and described previously in Technical Note 7 – Household Trip Rate Calibration.

2. VEHICLE AVAILABILITY CATEGORIES

As detailed in Technical Note 7, household category model structure was to comprise of ten household categories and four vehicle availability categories. The household categories involved six categories without children and four categories of families with older, younger and both age children.

It was found from analysis that the vehicle availability curves for each of the household categories were not sufficiently similar to allow the use of one overall set of vehicle availability curves for all HH categories. Consequently the vehicle availability for each HH category was separated and distinct curves for each were created.

The vehicle availability curves were created by firstly plotting average area unit vehicle ownership rates against the proportion of households in each area unit with 0, 1, 2 and 3+ vehicles available. A curve of best fit was calculated for each distribution to which a custom fit curve was created to ensure that each curve related to the others in the set.

These curves were subject to the constraints that the sum of proportions at any point must equal 1.0. It is not possible to maintain the average for the category when multiplying out the proportions because the vehicle data being used for each HH category is only a subset of the full vehicle data. The vehicle availability curves for each of the 10 household categories are shown in Figures 1 to 18.

3. INITIAL HOUSEHOLD CATEGORIES

The household category structure firstly involved households with 1 person, 2 persons and 3+ persons. The 1 and 2 person households were to be split into the working and non-working household categories of 1/2 and 3/4/5 respectively. The 3+ category did not require further definition and was used directly to create category 6.

Categories 7-10 involved families with children. It was anticipated that the different categories within this group could be related to average household age or size. This proved to be impossible for a number of reasons. Firstly, no correlation between children grouping and average age or size could be found and secondly it was impossible for Statistics New Zealand to provide data that could create a clear distinction between the three children groups of younger only, older only and both.

4. FINAL HOUSEHOLD CATEGORIES

After discussion it was considered that the differences in HIS trips rates for household categories 7/8/9/10 could be more to do with household size rather than the age of children. Statistics NZ provided additional Area Unit data for households, with and without children, based on household sizes of 1, 2, 3, 4 and 5+ persons.

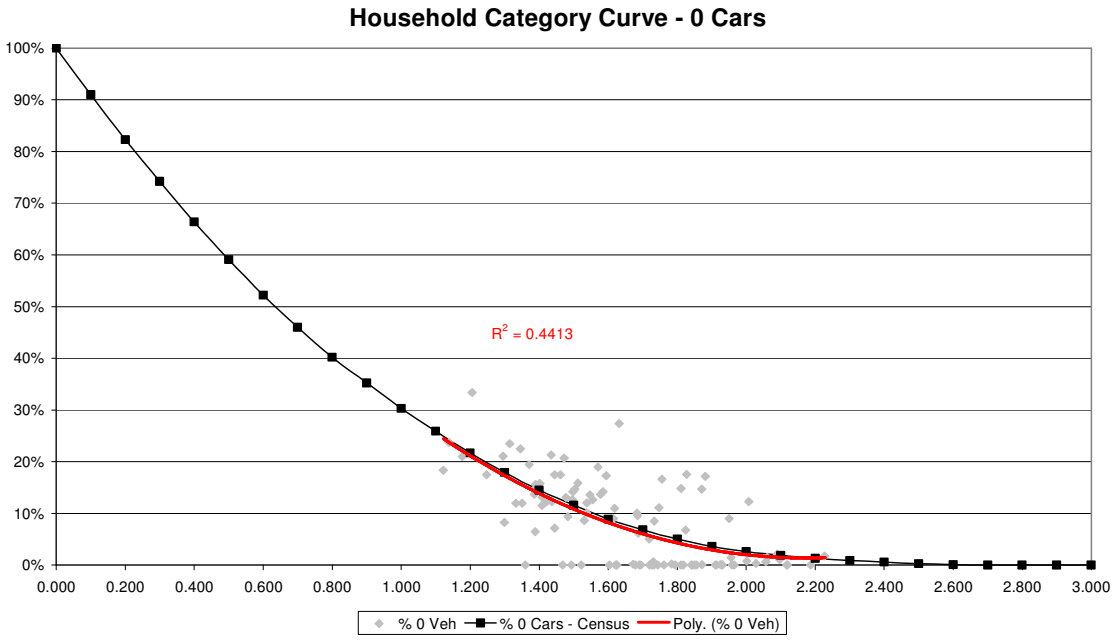
Plotting average AU household size against the following household size groups produced the set of suitable curves:

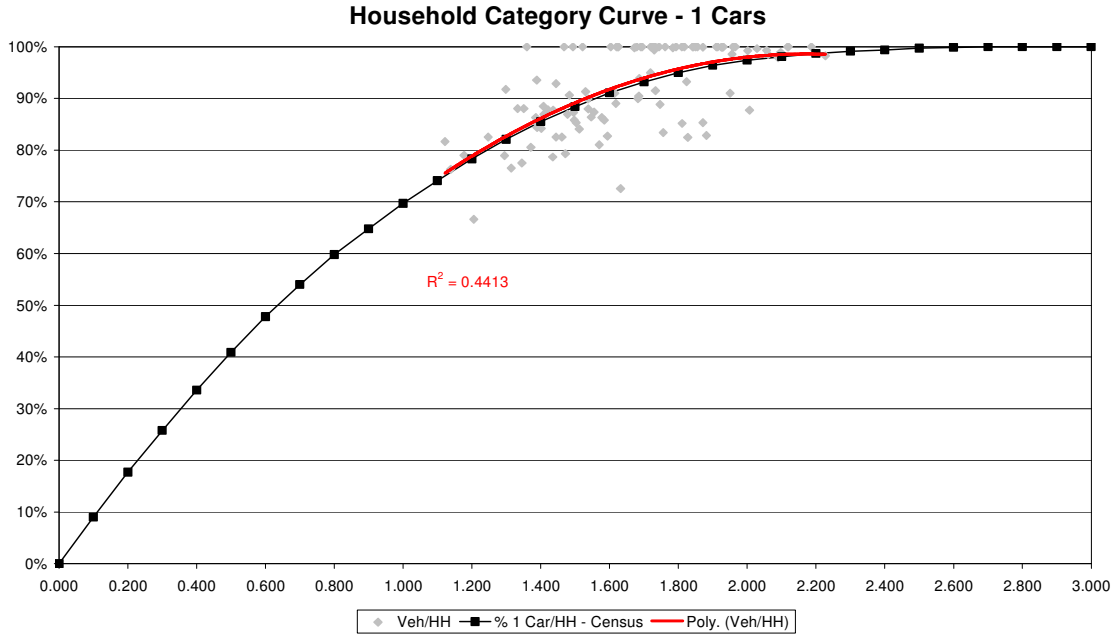
- HH with No Children – 1 person
- HH with No Children – 2 people
- HH with No Children – 3+ people
- HH with Children – 2 people
- HH with Children – 3 people
- HH with Children – 4 people
- HH with Children – 5+ people

These "first cut" curves are used to split households into the household groups before further division occurs into the final household categories. They were subject to the constraints that the sum of proportions at any point must equal 1.0 and that when multiplying out the proportions for each category the average for the category was maintained. These first cut household category curves are shown in Figures 19 to 22.

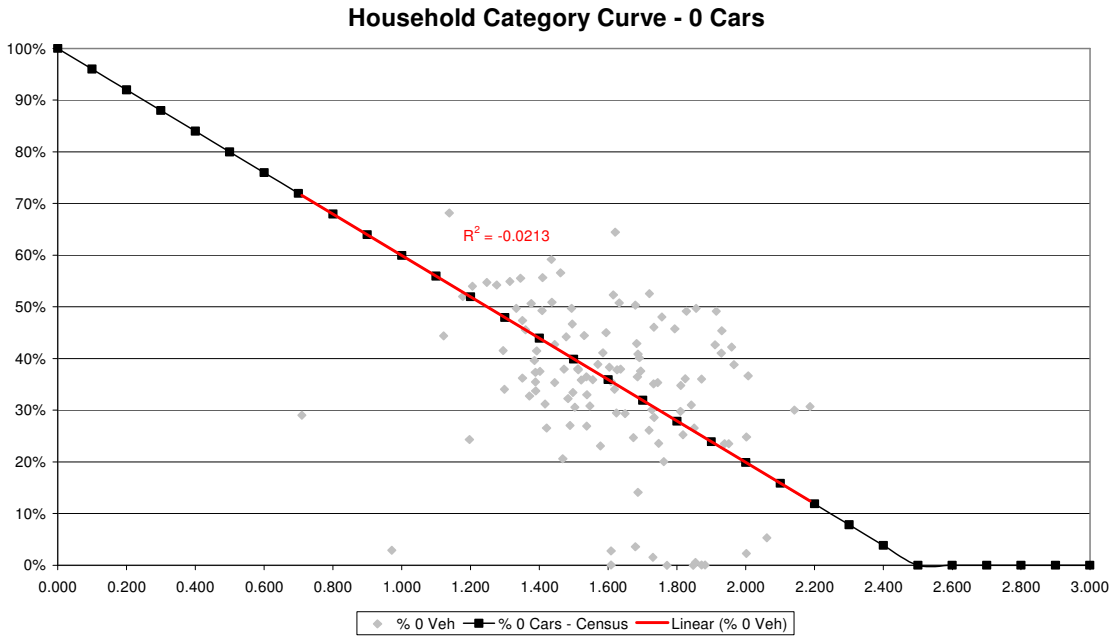
The "second cut" occurs to the HH with No Children – 1 person and HH with No Children – 2 people curves. This cut splits these households into those that are working and non-working. Statistics NZ produced data, that at an Area Unit level for the HIS area, indicated the number of 1 person households that no adult working and 1 adult working and in 2 person households had no adult working, 1 adult working and 2 adults working.

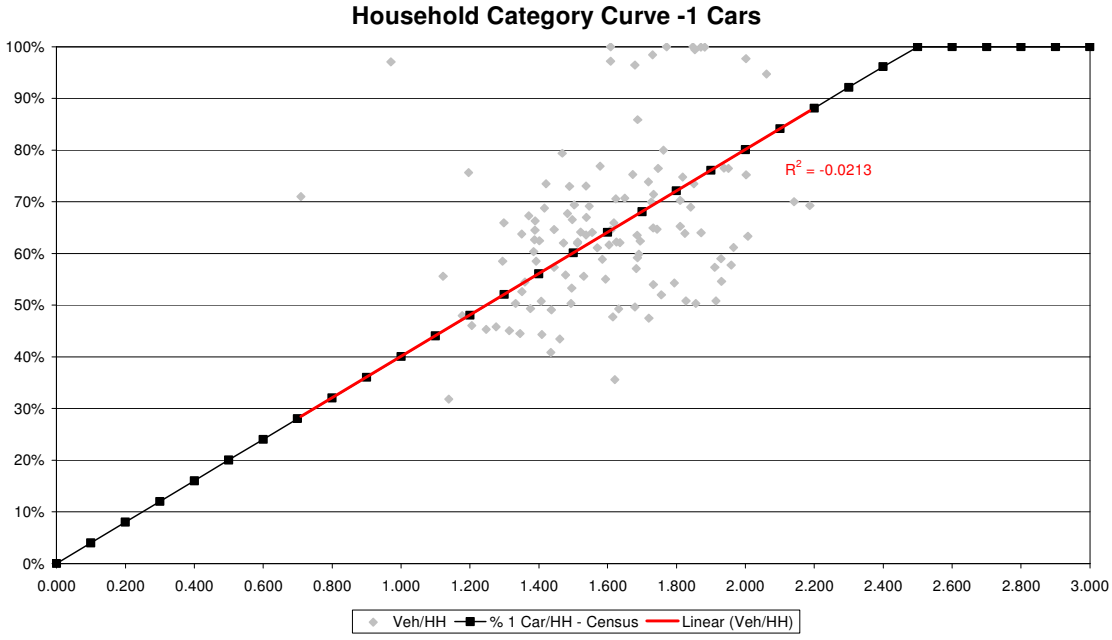
This level of working data was plotted against the average number of people employed for each Area Unit. A set of curves of best fit was calculated for each distribution to which a custom fit curve was created to ensure that each curve related to the others in the set. The employment category curves for No Children – 1 person households are shown in Figure 23 and the employment category curves for No Children – 2 people households are shown in Figures 24 and 25.



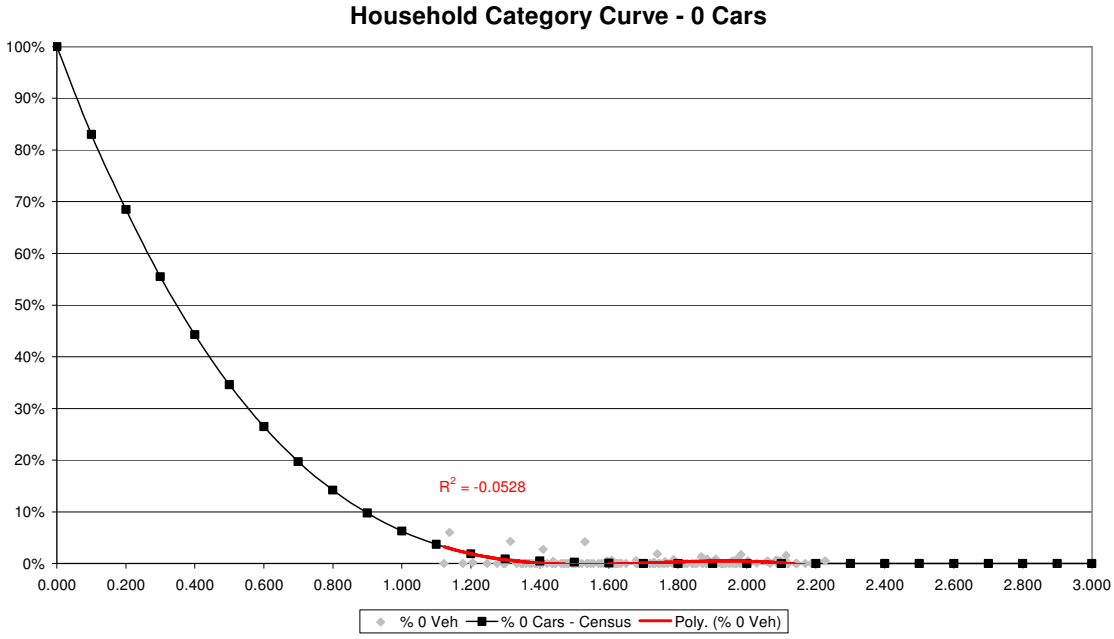


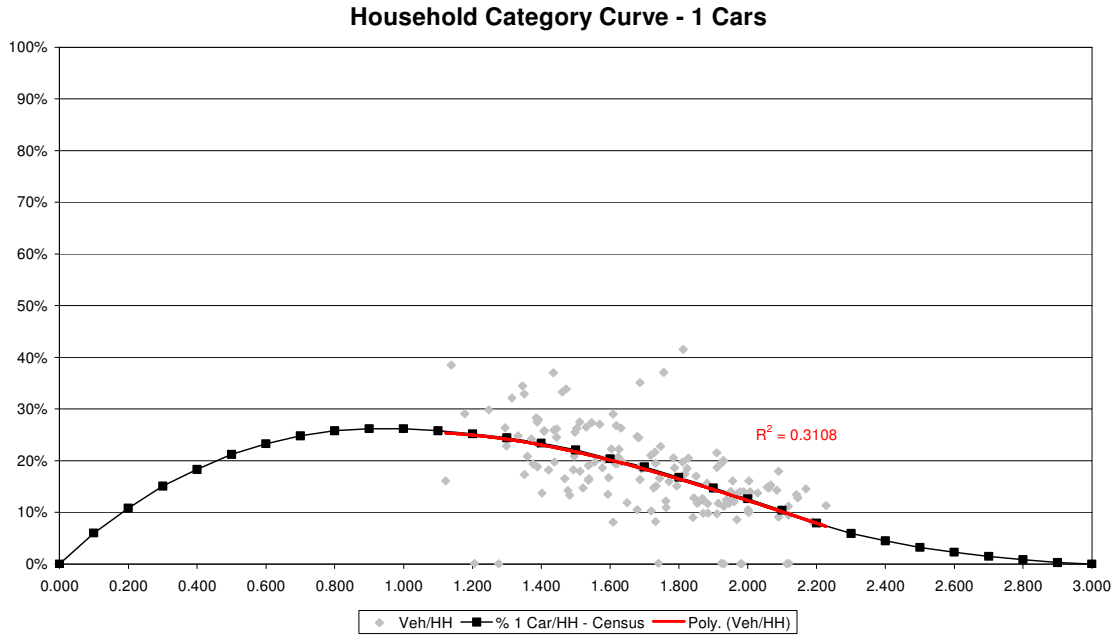
Waikato Regional Transport Model	**Vehicle Ownership Curves** **1 Adult Working Households** **0 and 1 Vehicle/HH**	**Figure 1**
Household Distribution Model Category Curves		



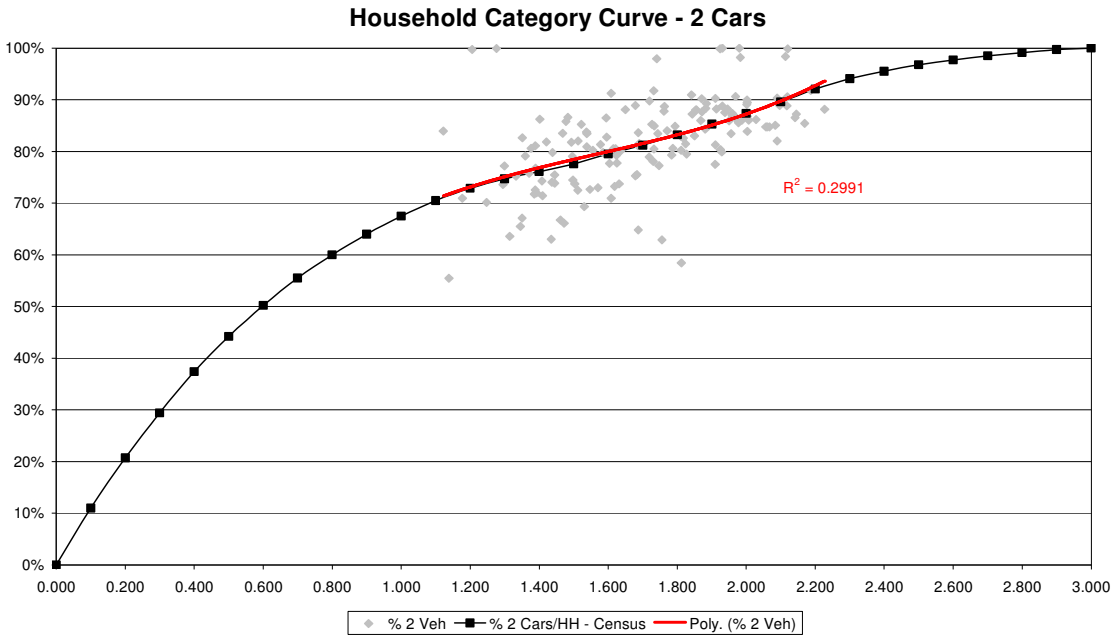


Waikato Regional Transport Model	**Vehicle Ownership Curves** **1 Adult Not Working Households** **0 and 1 Vehicle/HH**	**Figure 2**
Household Distribution Model Category Curves		

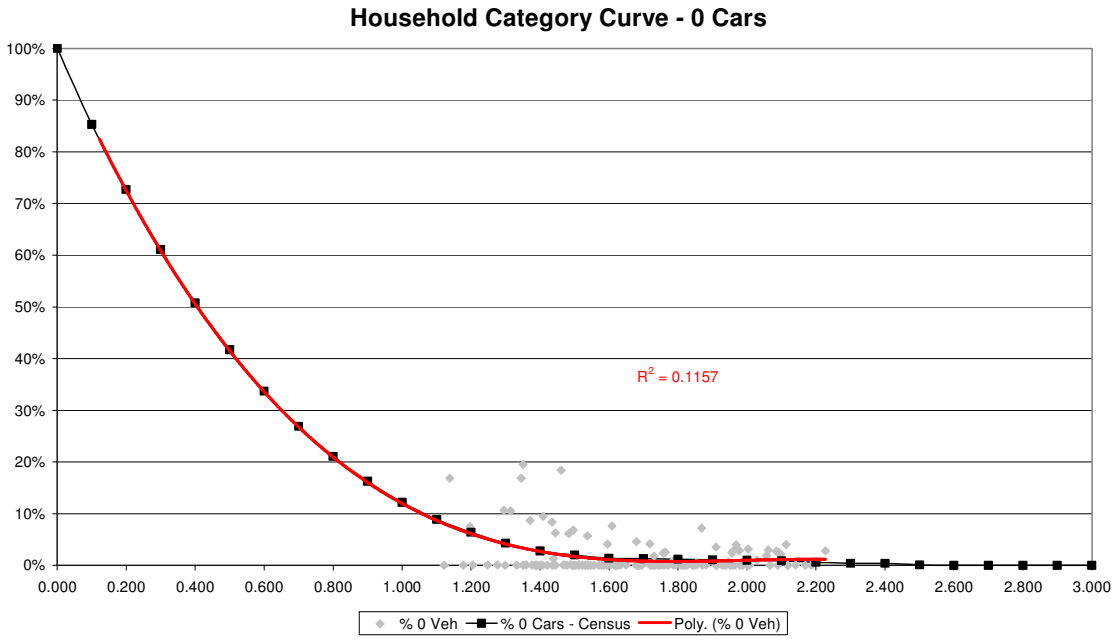


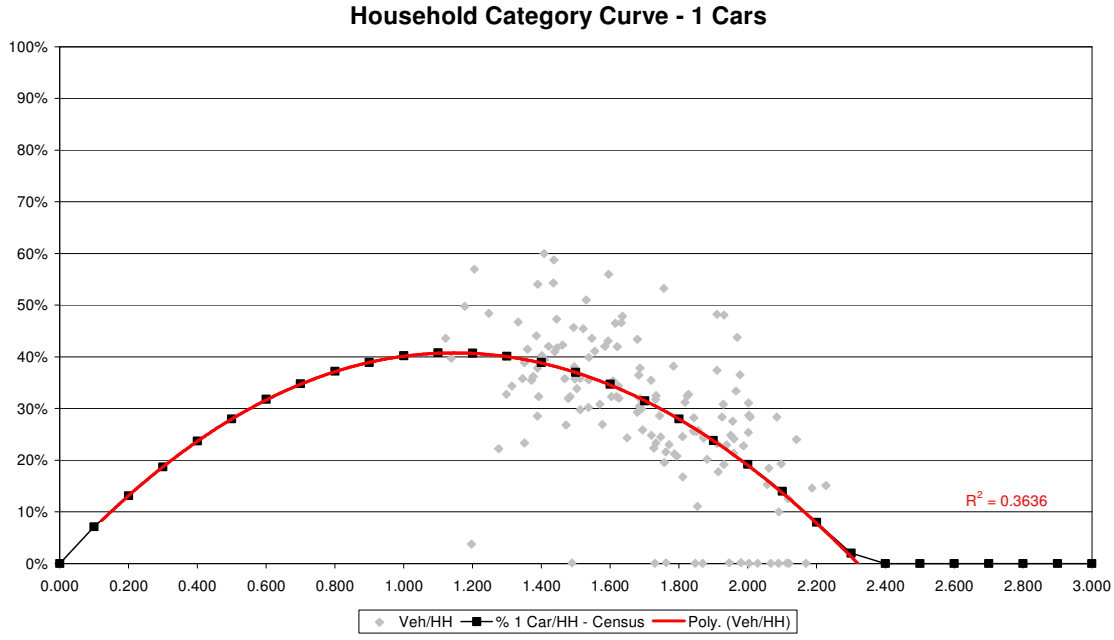


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult Both Working Households** **0 and 1 Vehicle/HH**	**Figure 3**
Household Distribution Model Category Curves		

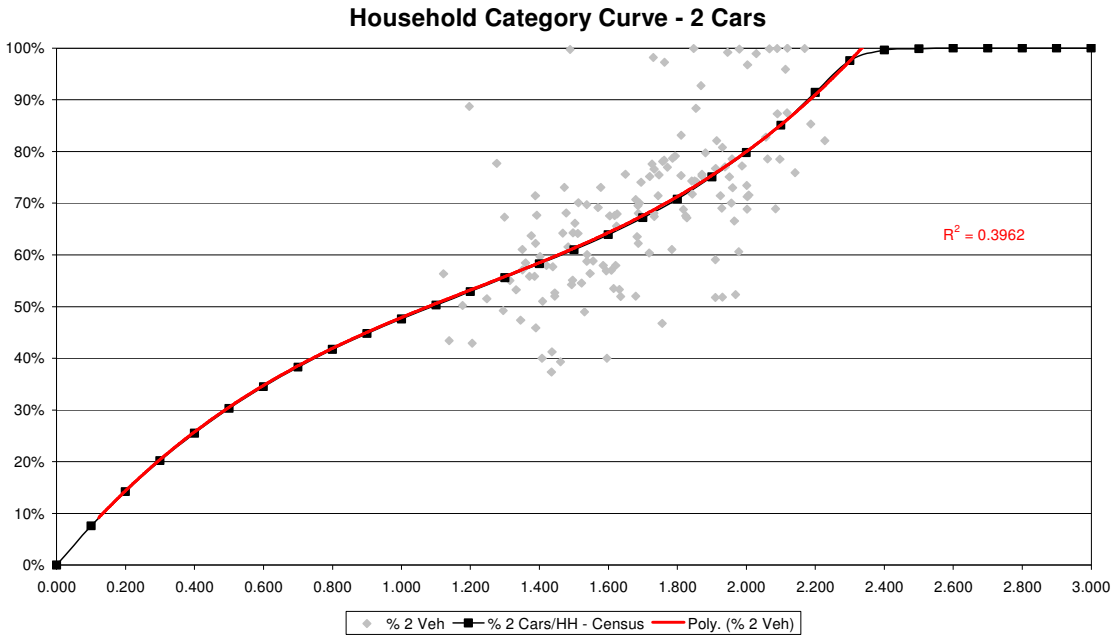


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult Both Working Households** **2+ Vehicle/HH**	**Figure 4**
Household Distribution Model Category Curves		

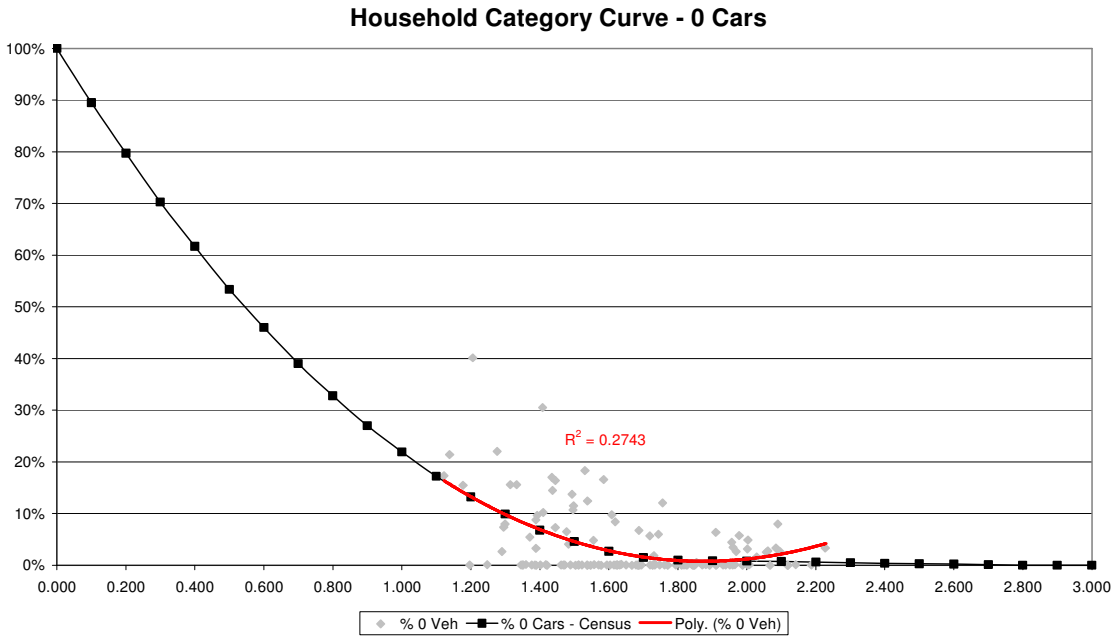


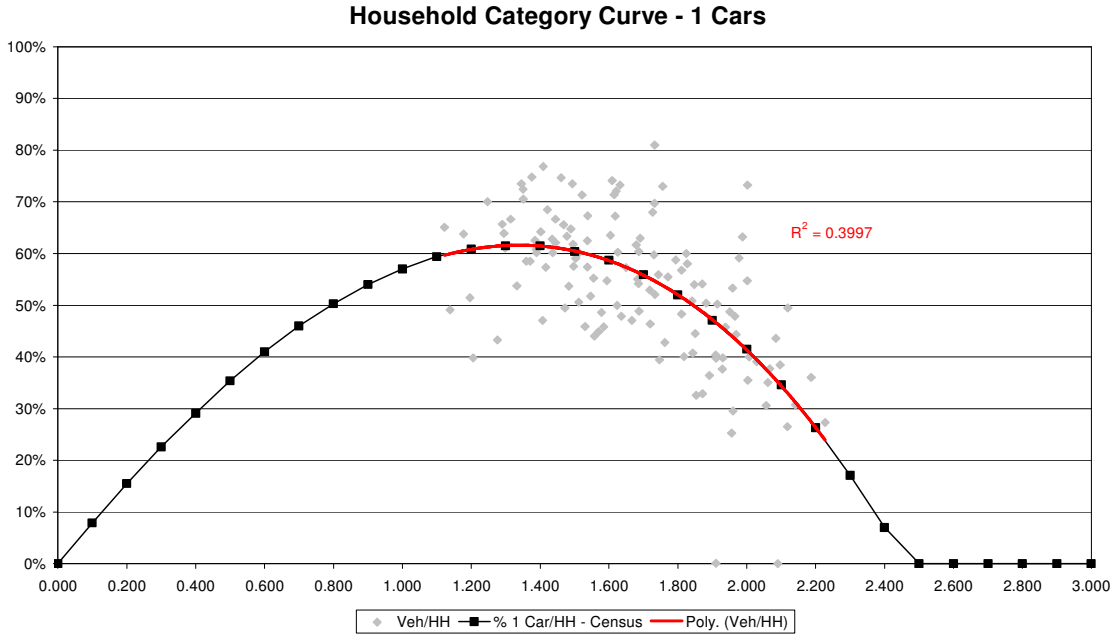


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult 1 Working Households** **0 and 1 Vehicle/HH**	**Figure 5**
Household Distribution Model Category Curves		

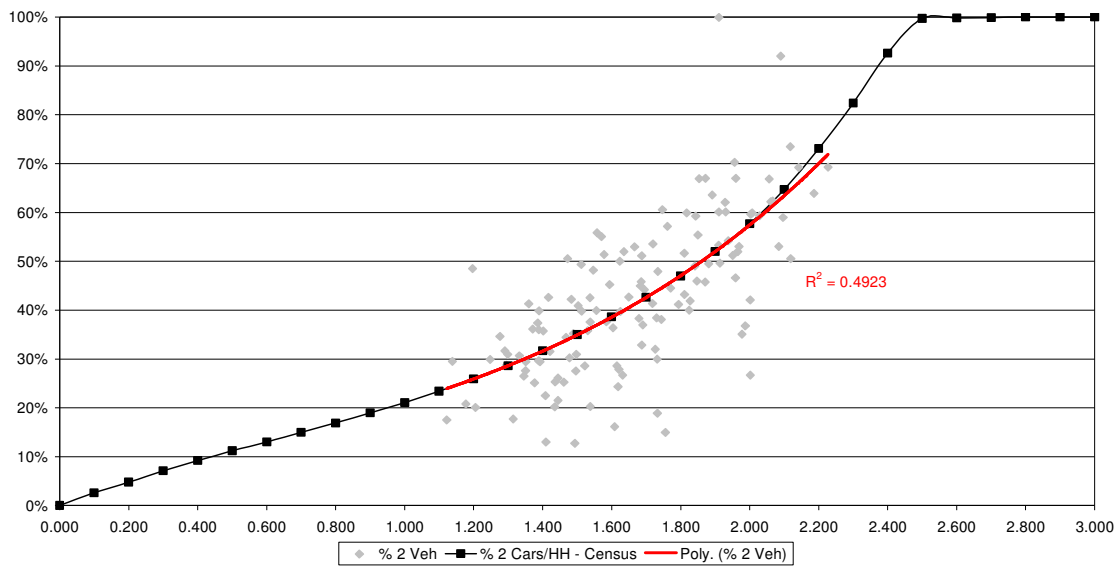


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult 1 Working Households** **2+ Vehicle/HH**	**Figure 6**
Household Distribution Model Category Curves		

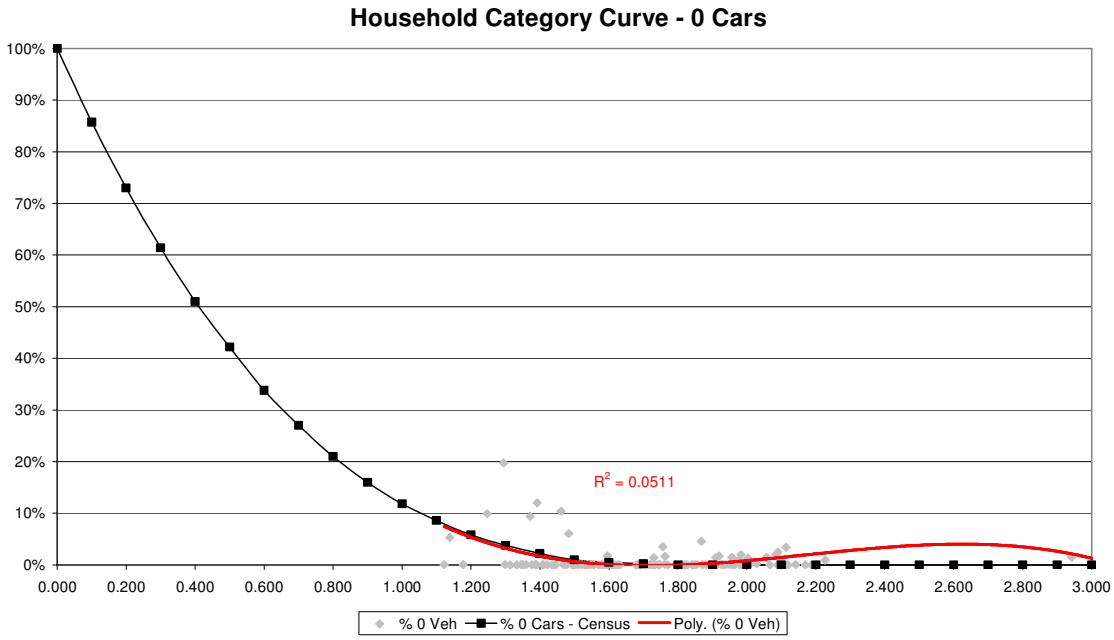


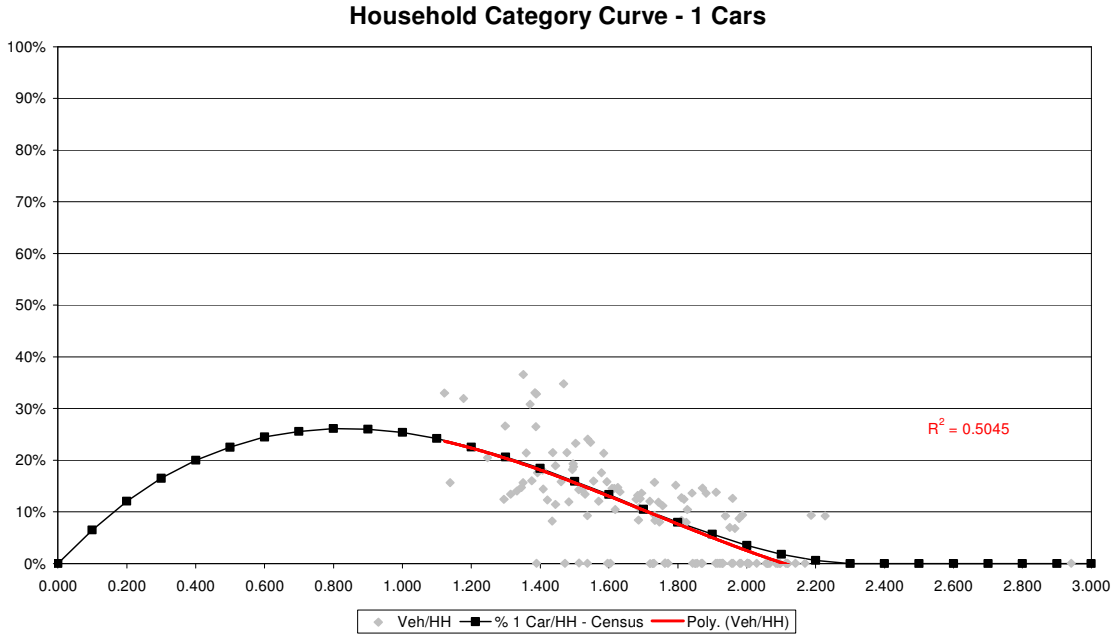


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult 0 Working Households** **0 and 1 Vehicle/HH**	**Figure 7**
Household Distribution Model Category Curves		

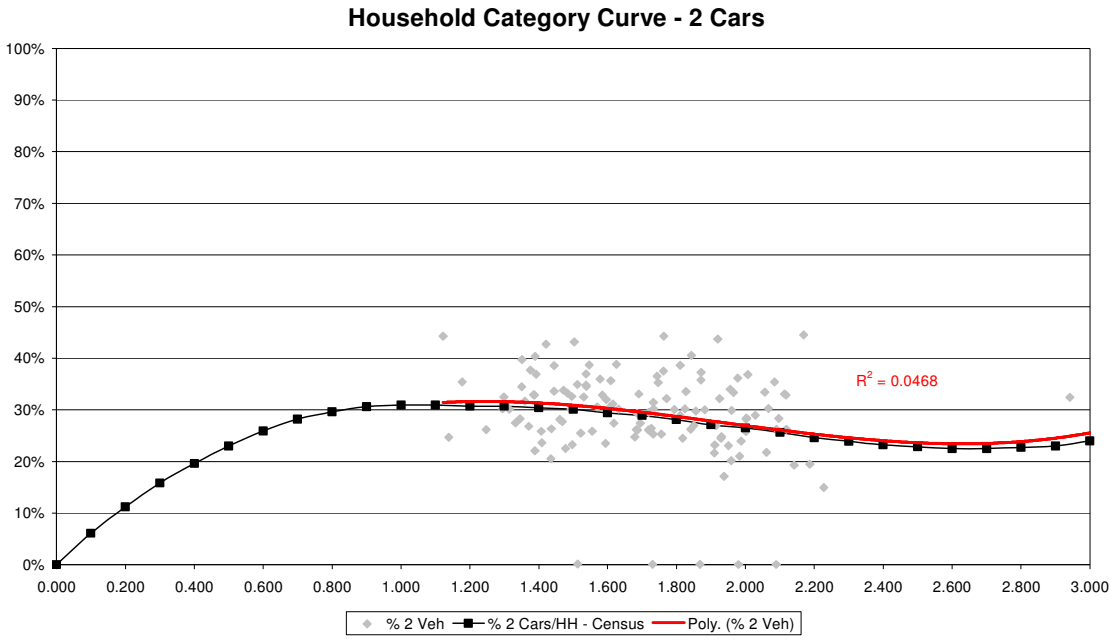


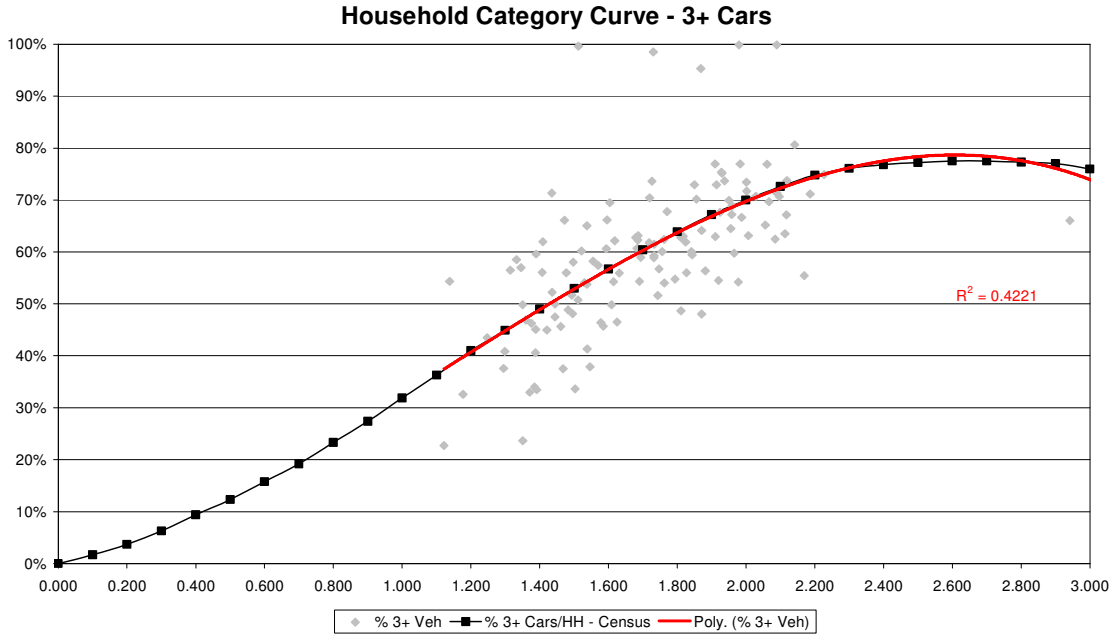
Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Adult 0 Working Households** **2+ Vehicle/HH**	**Figure 8**
Household Distribution Model Category Curves		



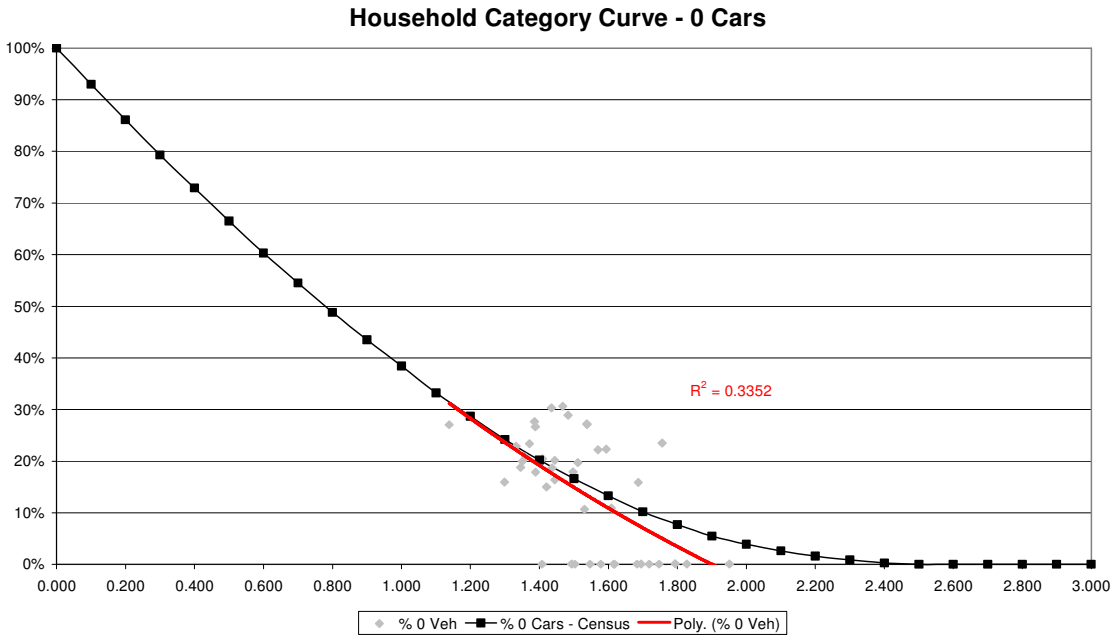


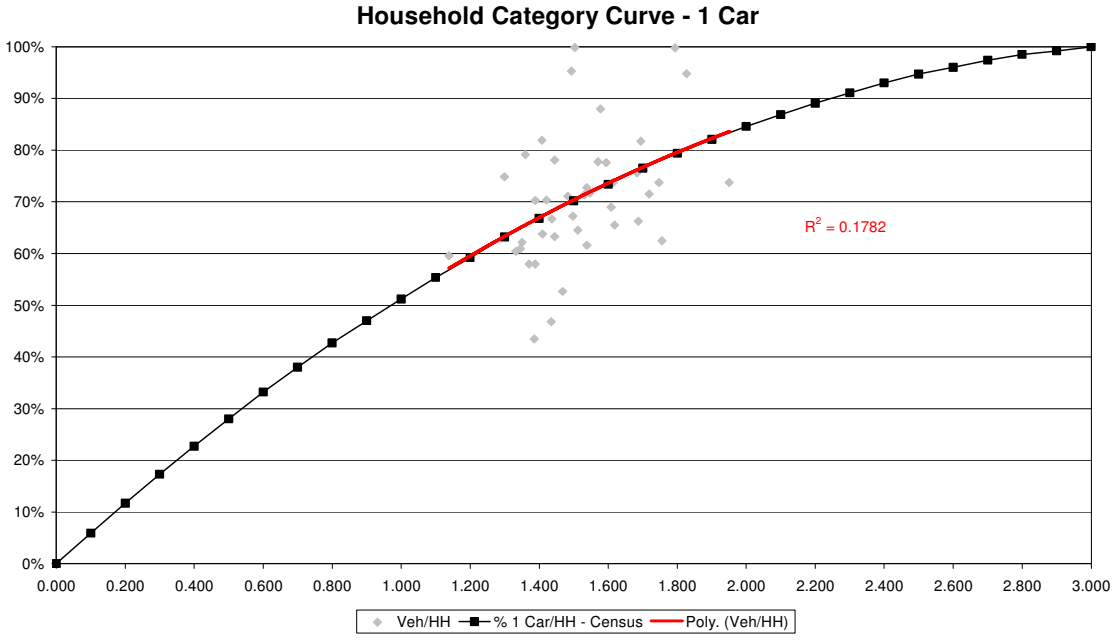
Waikato Regional Transport Model	**Vehicle Ownership Curves 3+ Adult Households 0 and 1 Vehicle/HH**	**Figure 9**
Household Distribution Model Category Curves		



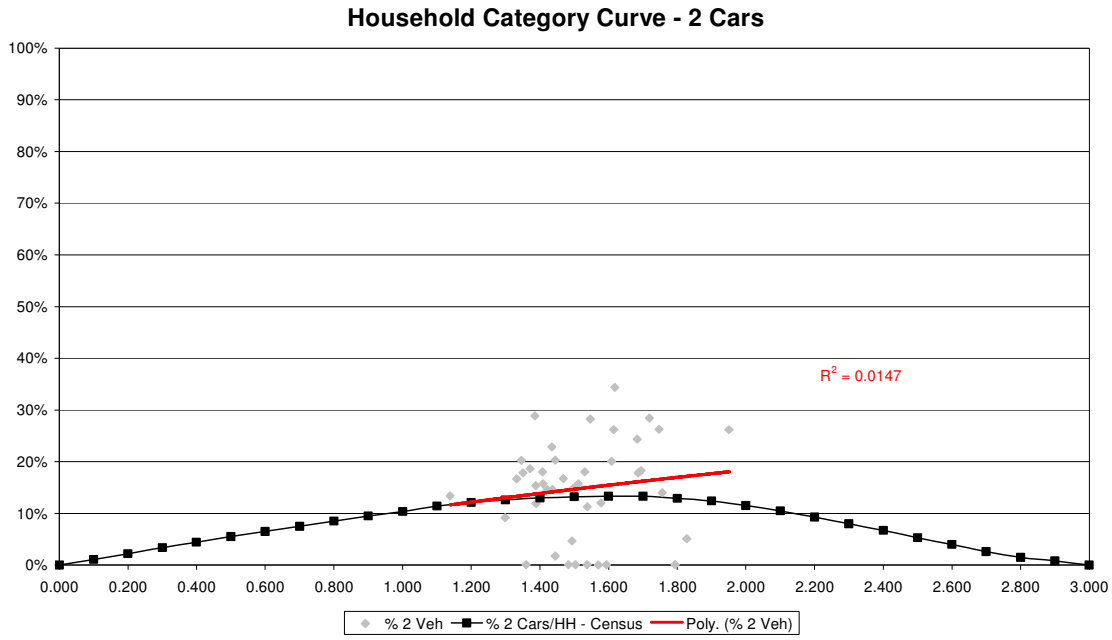


Waikato Regional Transport Model	**Vehicle Ownership Curves 3+ Adult Households 2 and 3+ Vehicle/HH**	**Figure 10**
Household Distribution Model Category Curves		

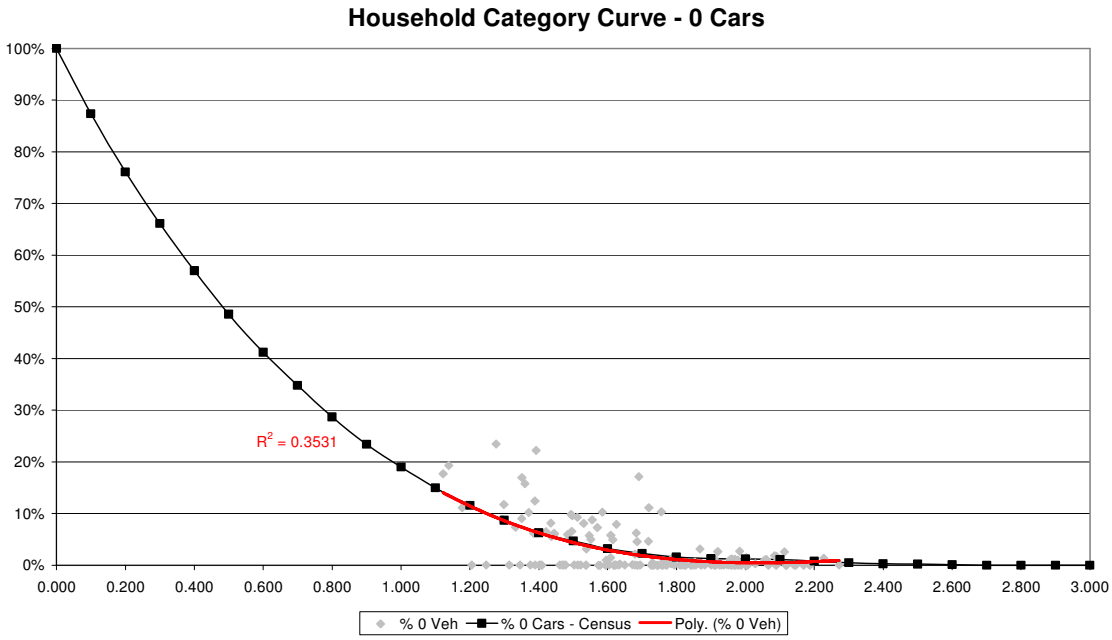


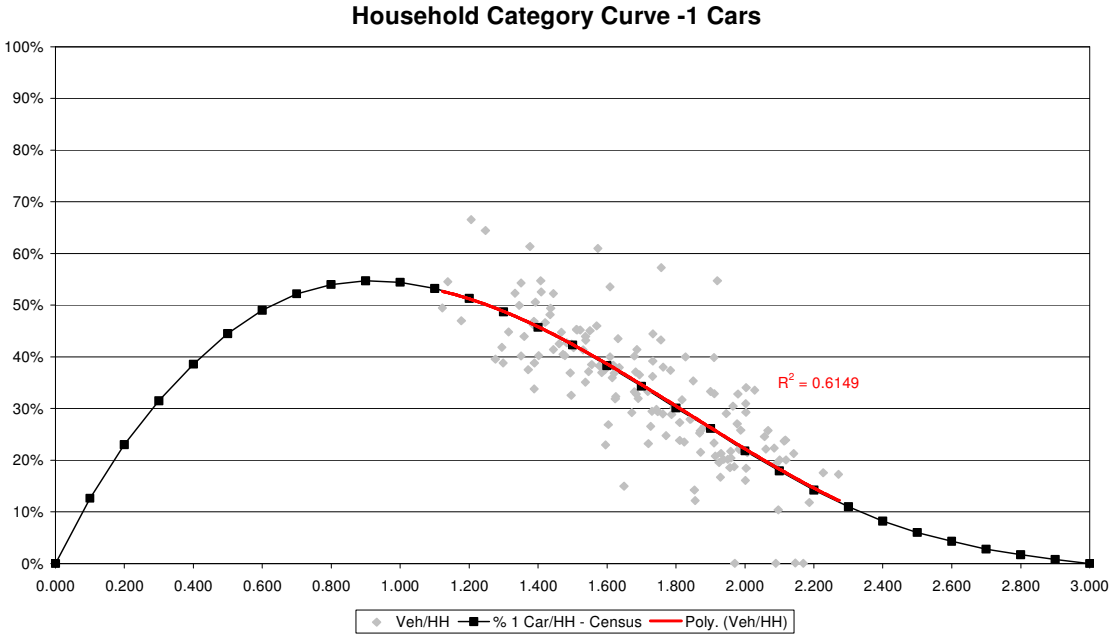


Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Person Family Households** **0 and 1 Vehicle/HH**	**Figure 11**
Household Distribution Model Category Curves		

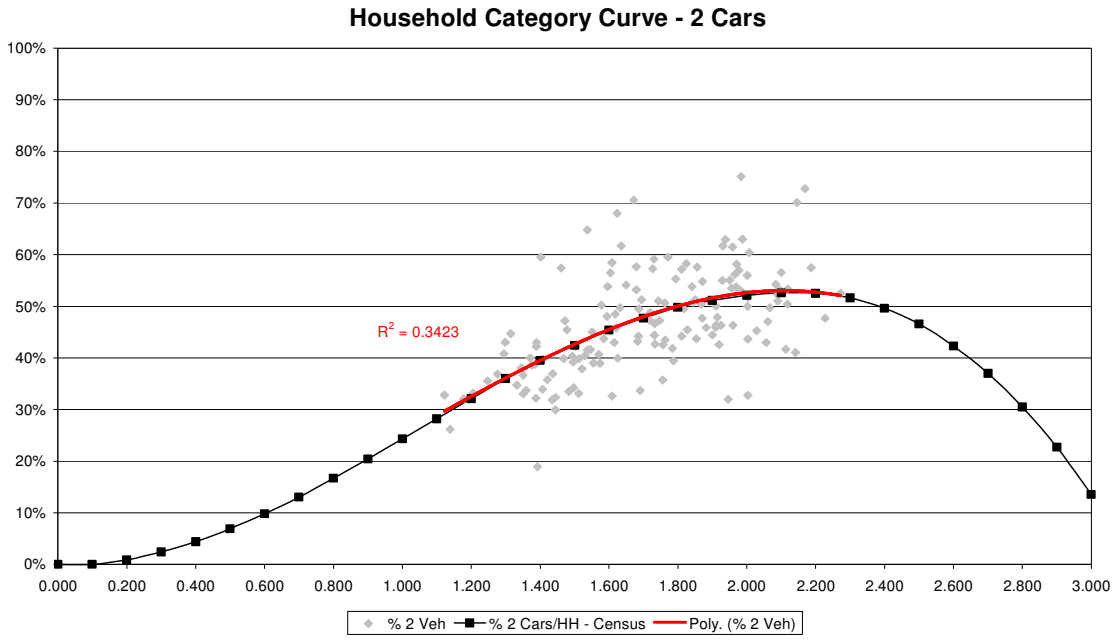


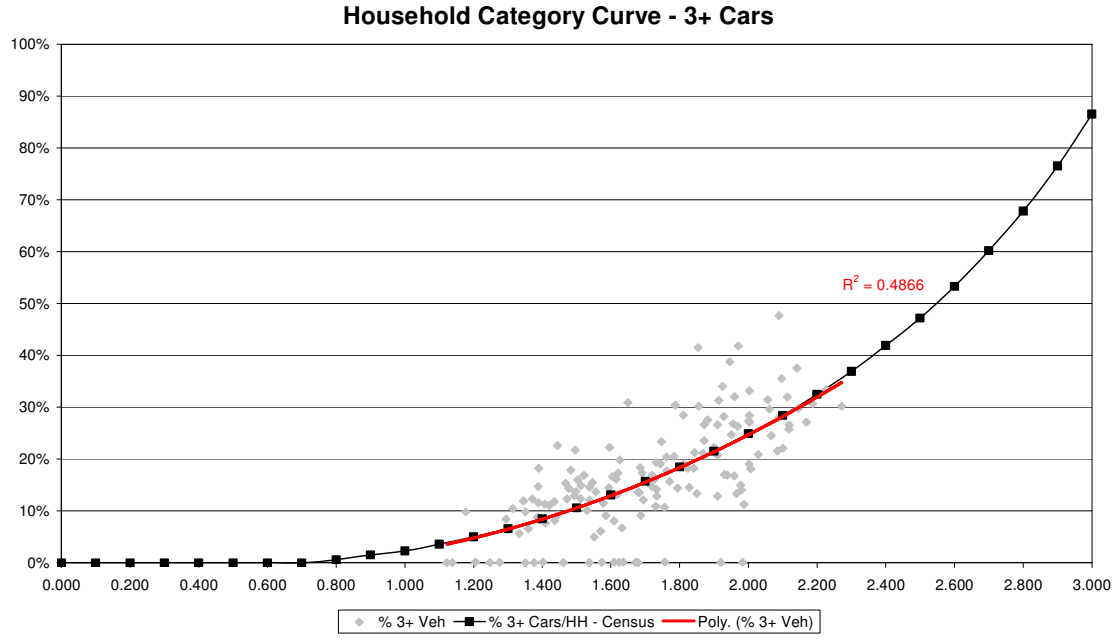
Waikato Regional Transport Model	**Vehicle Ownership Curves** **2 Person Family Households** **2 Vehicle/HH**	**Figure 12**
Household Distribution Model Category Curves		



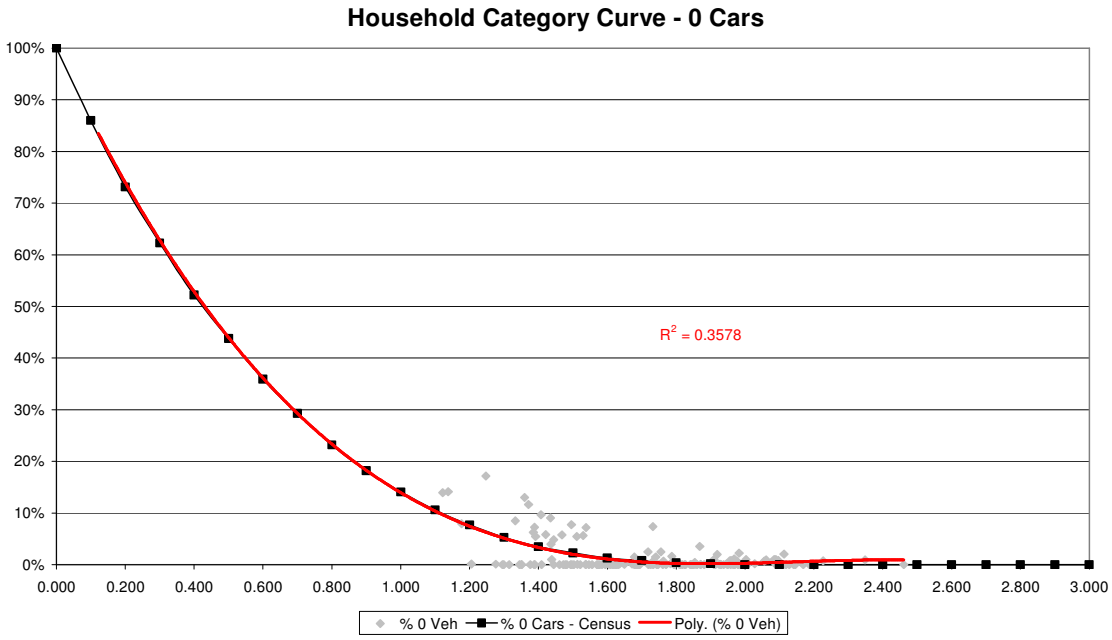


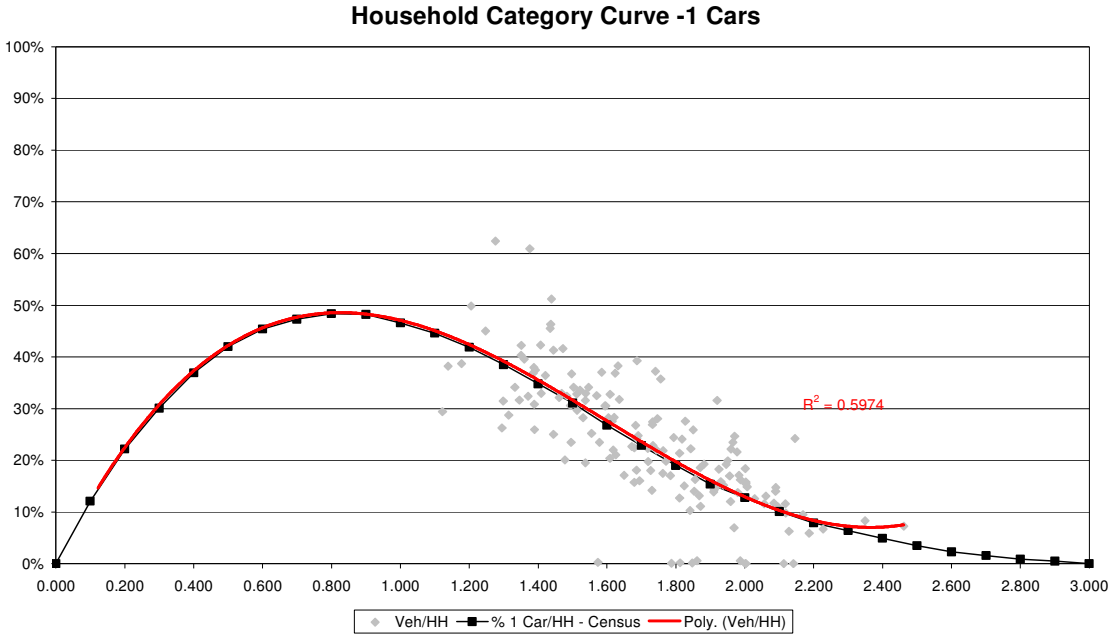
Waikato Regional Transport Model	**Vehicle Ownership Curves** **3 Person Family Households** **0 and 1 Vehicle/HH**	**Figure 13**
Household Distribution Model Category Curves		



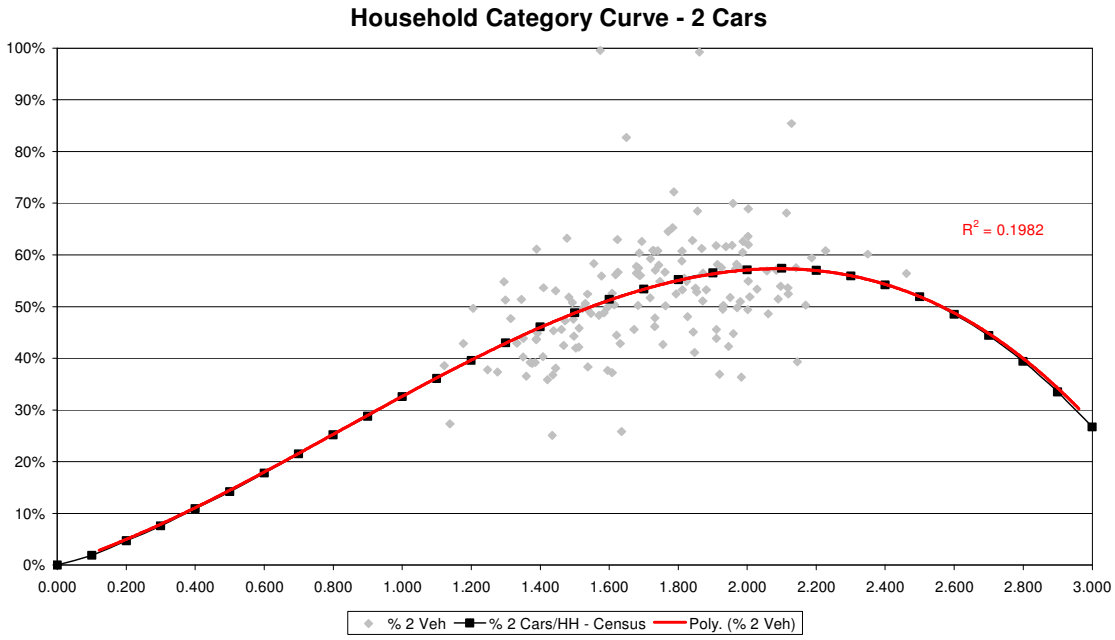


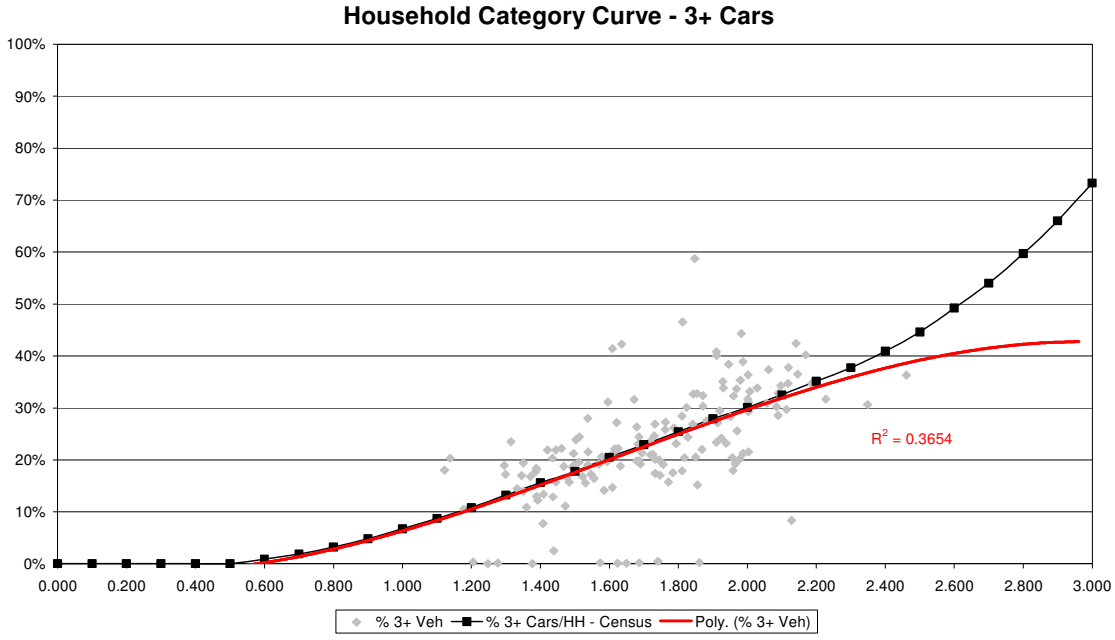
Waikato Regional Transport Model	**Vehicle Ownership Curves 3 Person Family Households 2 and 3+ Vehicle/HH**	**Figure 14**
Household Distribution Model Category Curves		



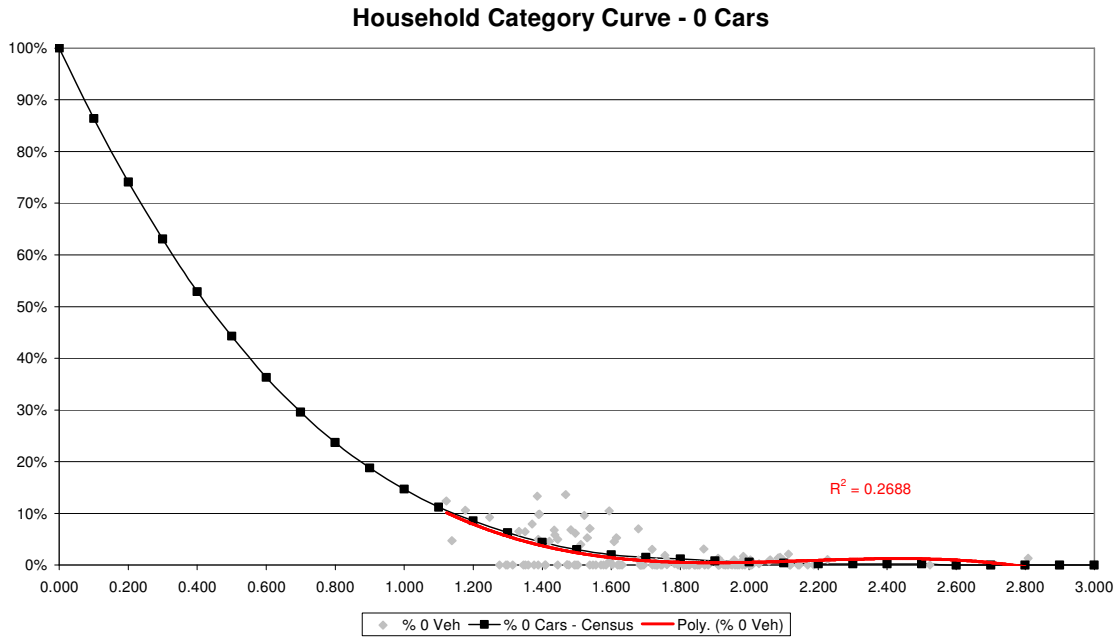


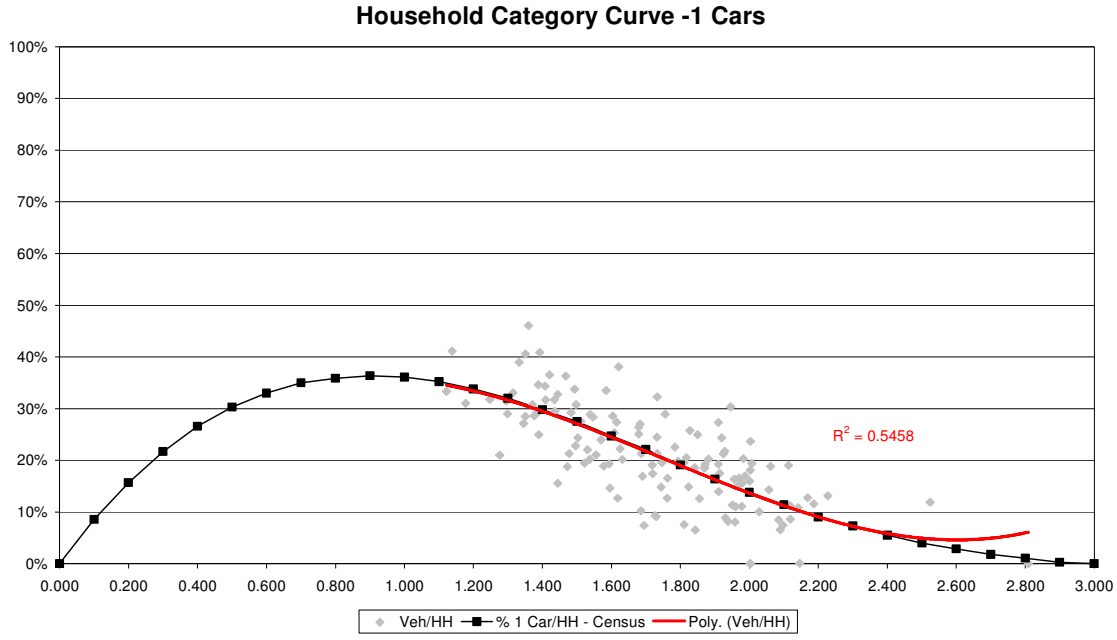
Waikato Regional Transport Model	**Vehicle Ownership Curves** **4 Person Family Households** **0 and 1 Vehicle/HH**	**Figure 15**
Household Distribution Model Category Curves		



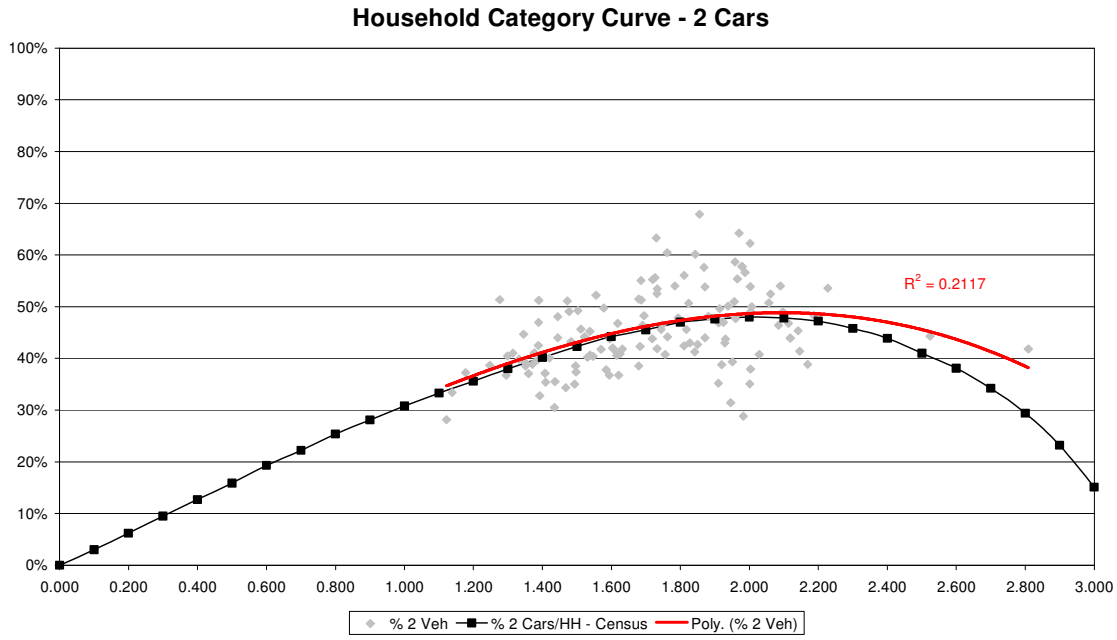


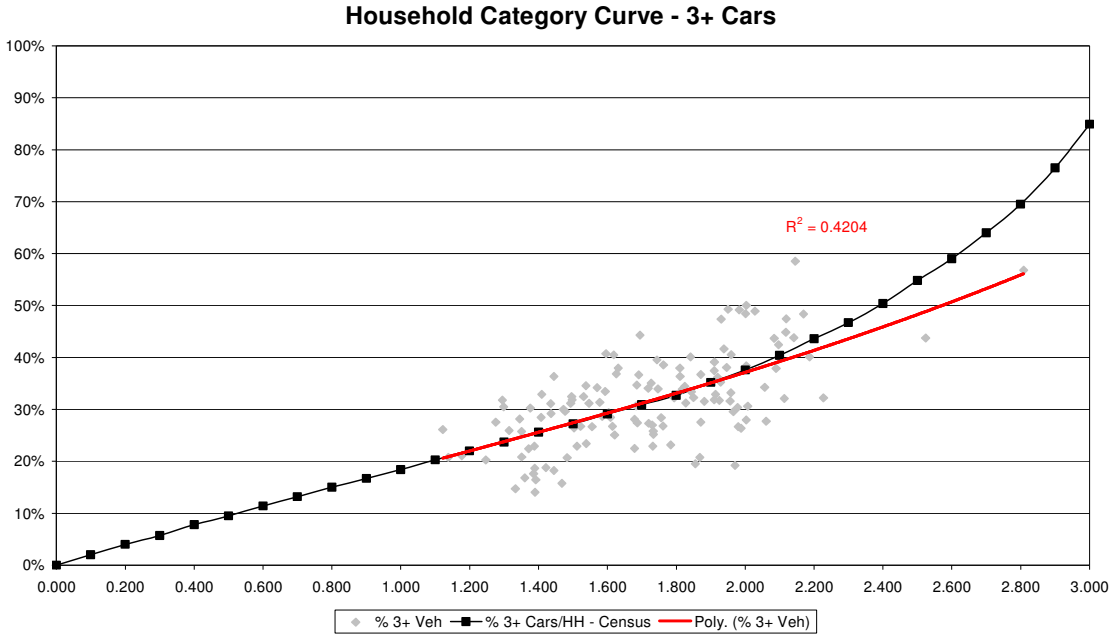
Waikato Regional Transport Model	**Vehicle Ownership Curves** **4 Person Family Households** **2 and 3+ Vehicle/HH**	**Figure 16**
Household Distribution Model Category Curves		



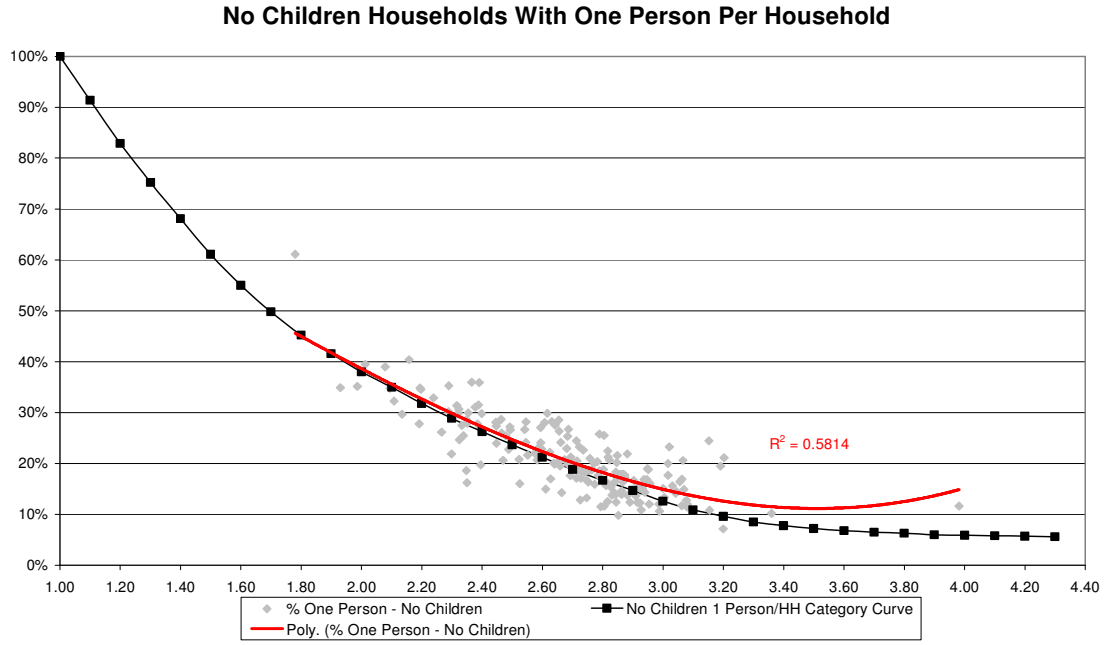


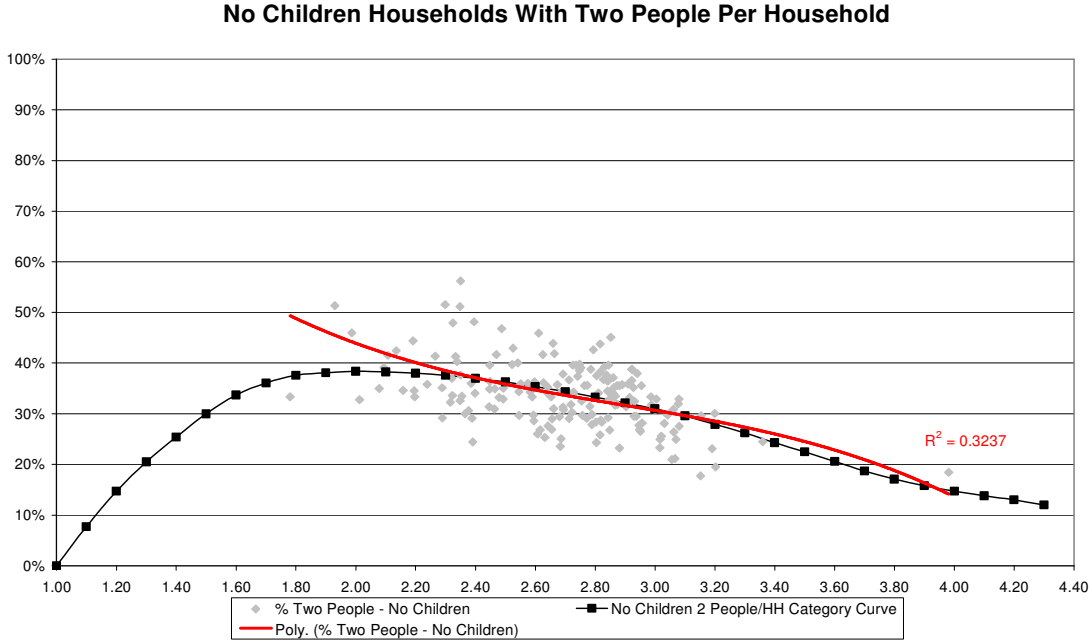
Waikato Regional Transport Model	**Vehicle Ownership Curves** **5+ Person Family Households** **0 and 1 Vehicle/HH**	**Figure 17**
Household Distribution Model Category Curves		



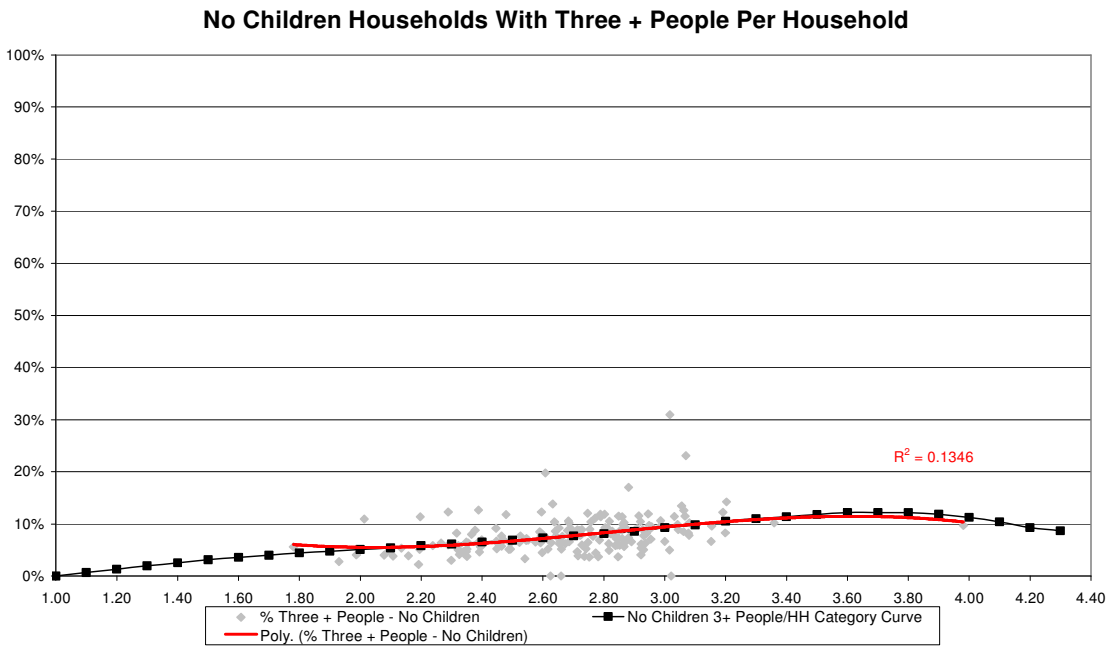


Waikato Regional Transport Model Household Distribution Model Category Curves	**Vehicle Ownership Curves 5+ Person Family Households 2 and 3+ Vehicle/HH**	**Figure 18**

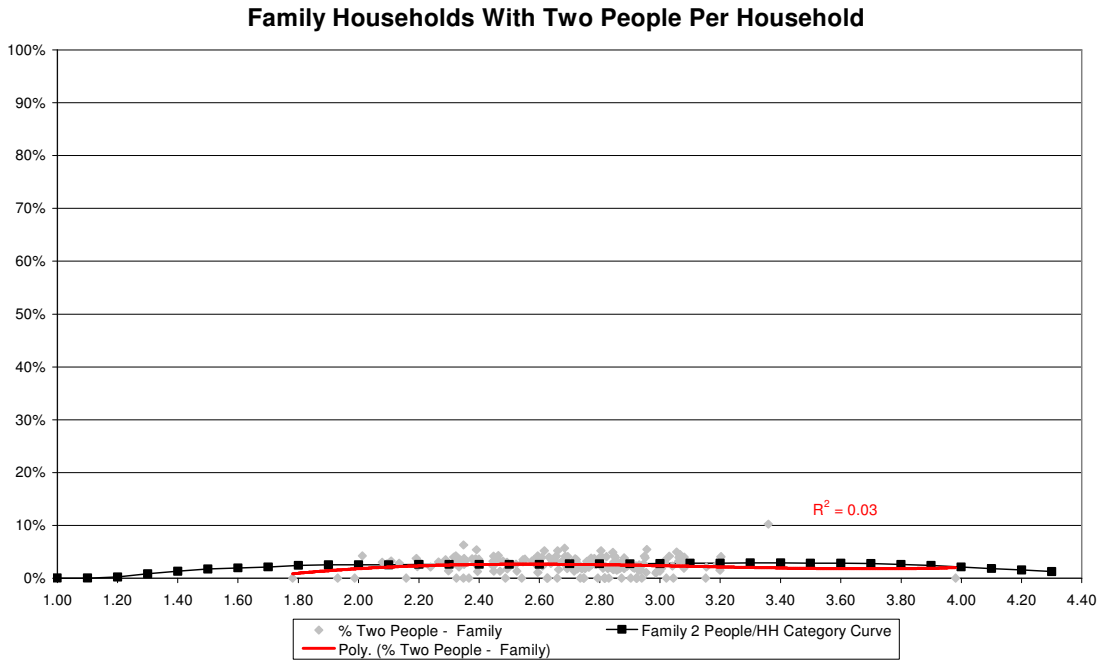


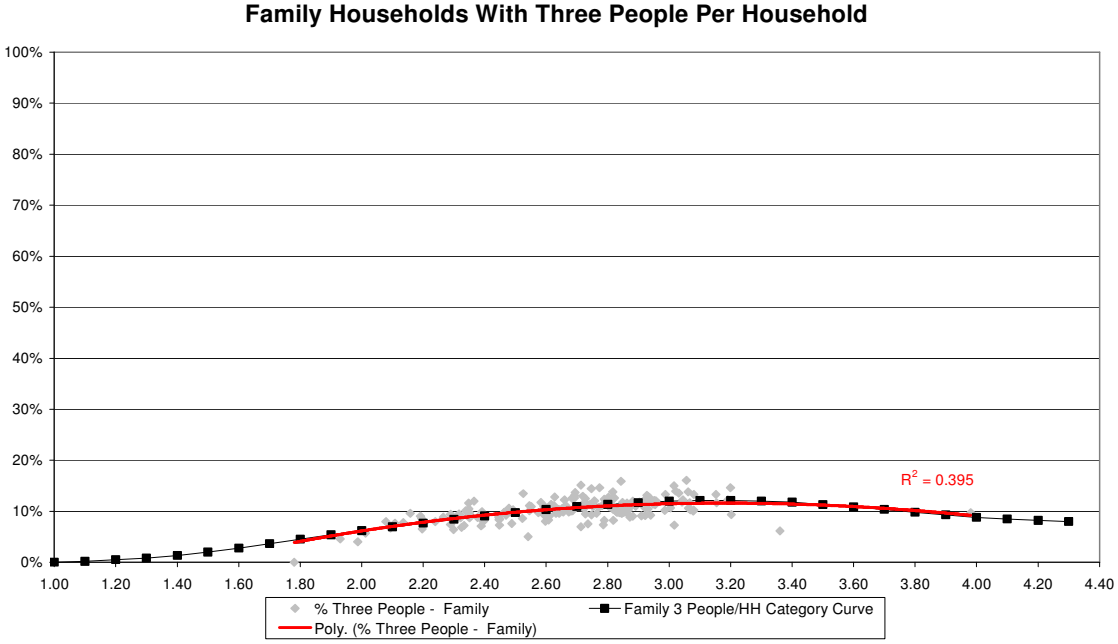


Waikato Regional Transport Model Household Distribution Model Category Curves	**First Cut Household Curves HH with No Children 1 and 2 People**	**Figure 19**

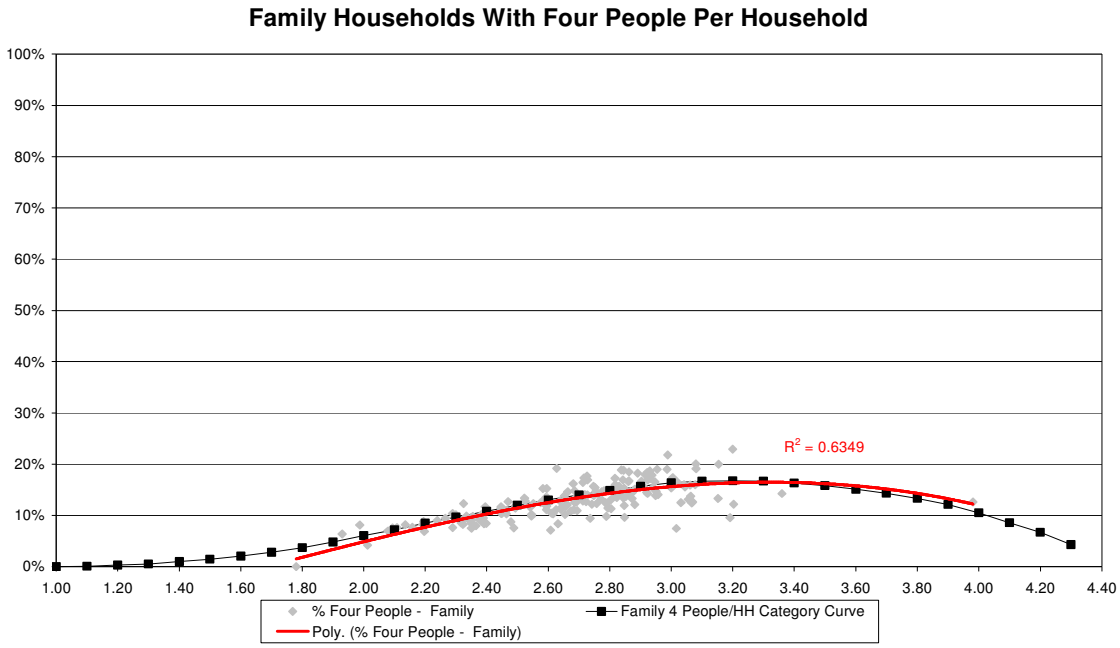


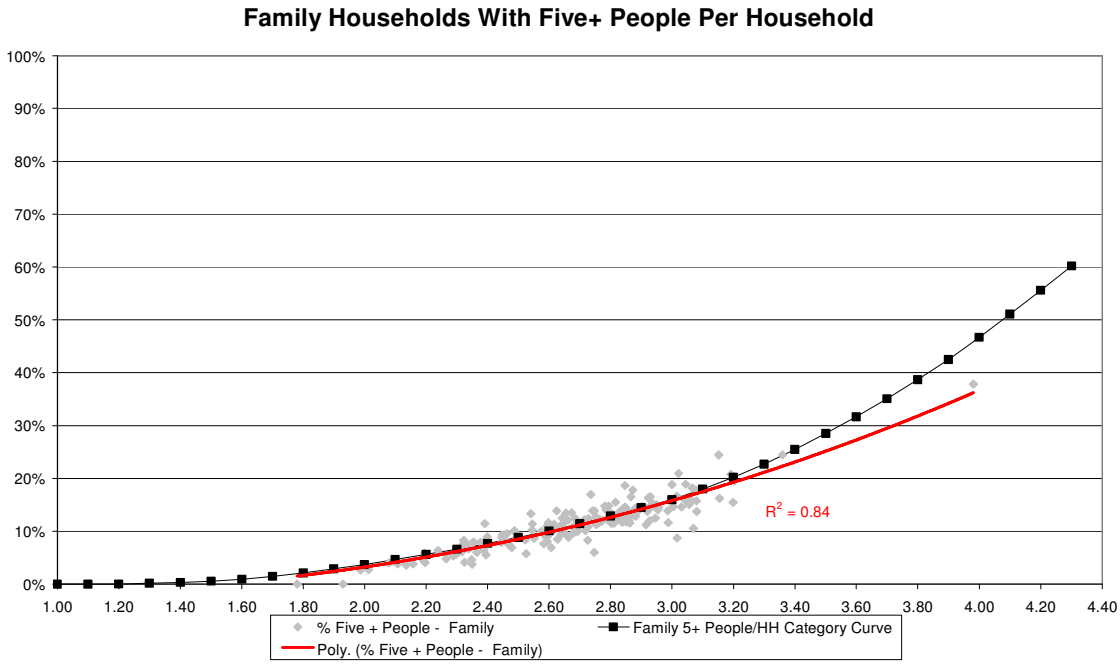
Waikato Regional Transport Model	**First Cut Household Curves HH with No Children 3+ People**	**Figure 20**
Household Distribution Model Category Curves		



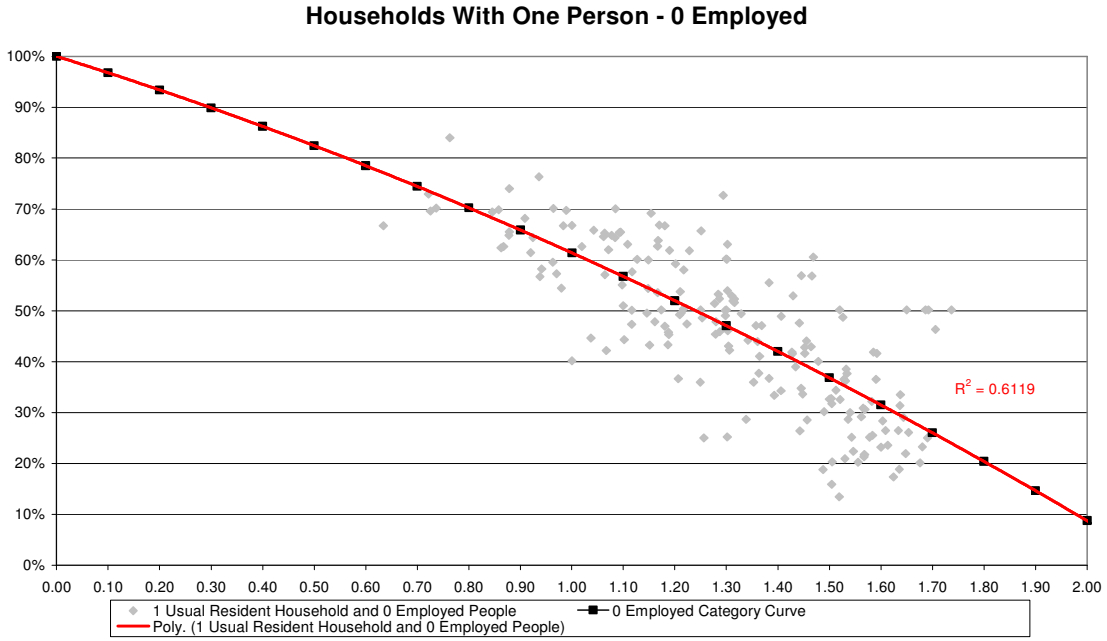


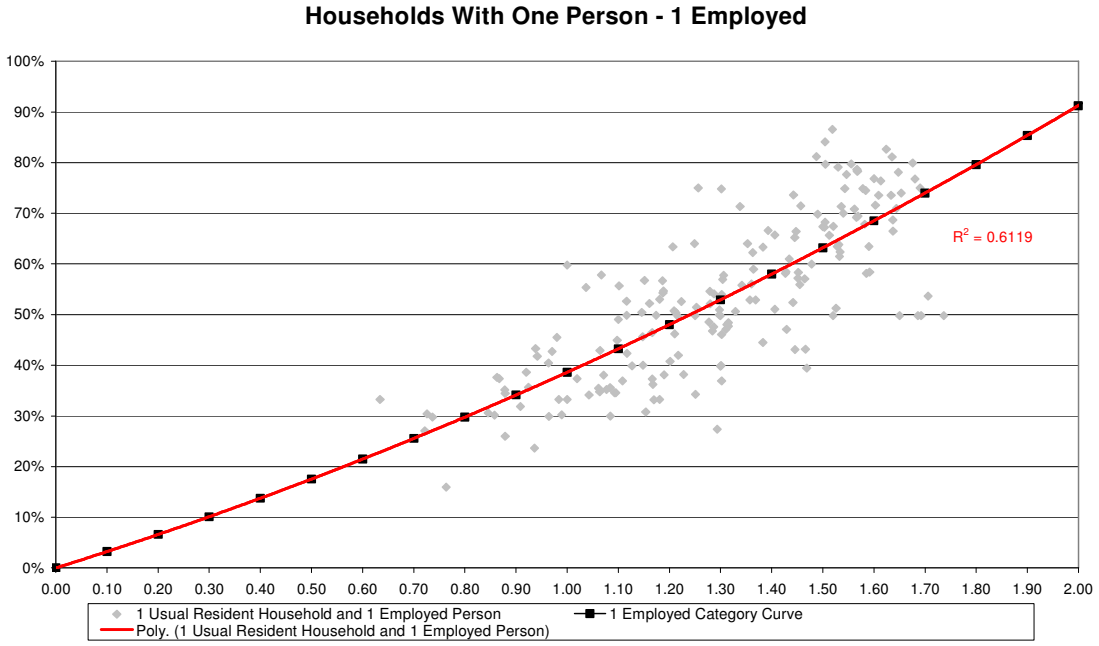
Waikato Regional Transport Model	**First Cut Household Curves HH with Children 2 and 3 People**	**Figure 21**
Household Distribution Model Category Curves		





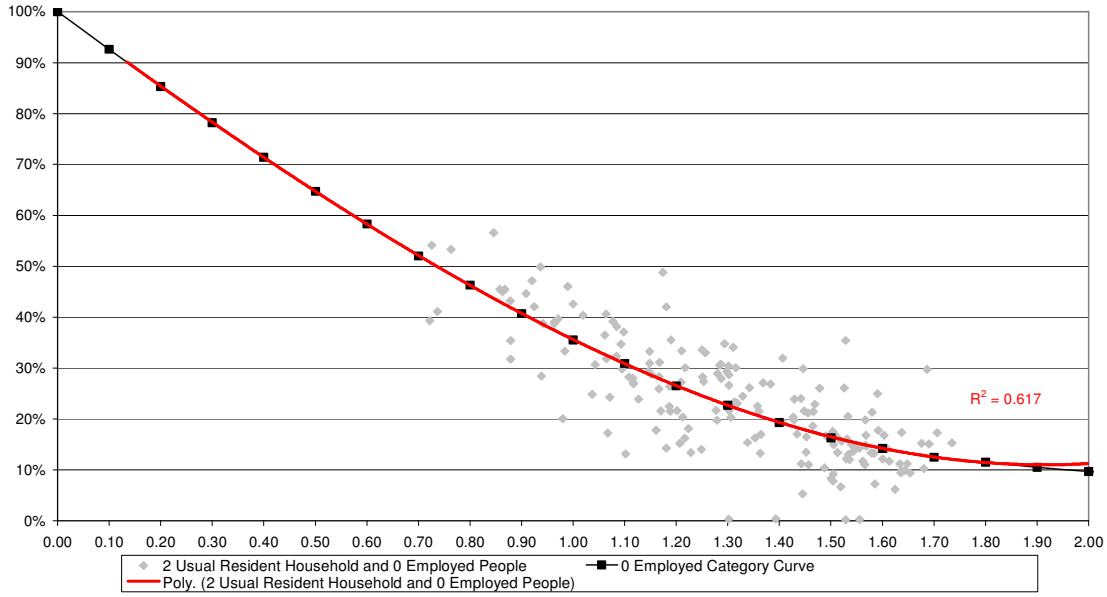
Waikato Regional Transport Model	**First Cut Household Curves HH with Children 4 and 5+ People**	**Figure 22**
Household Distribution Model Category Curves		



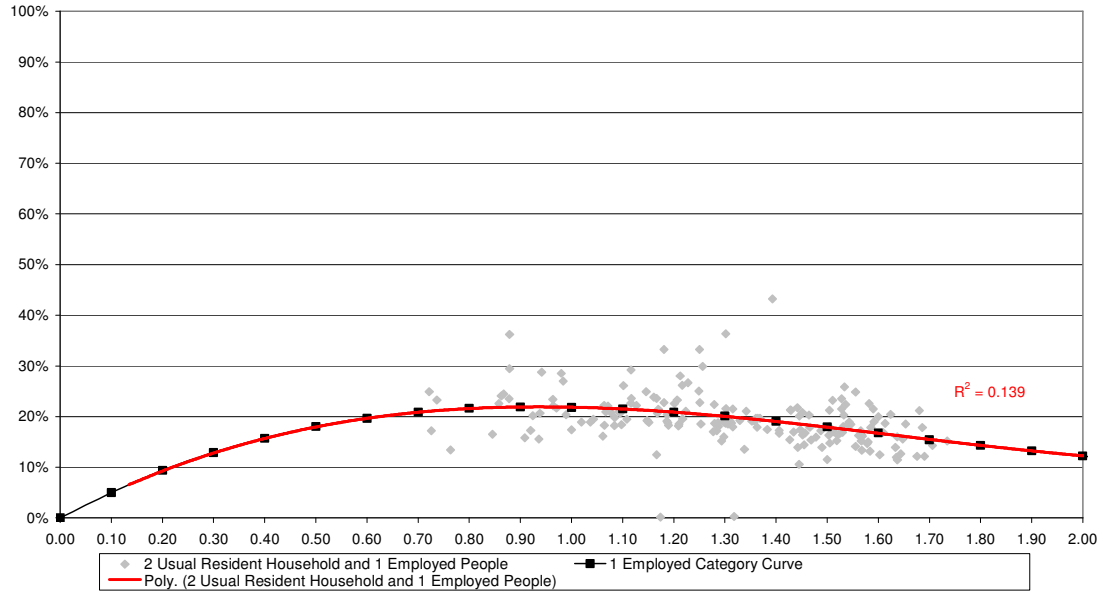


Waikato Regional Transport Model Household Distribution Model Category Curves	**Second Cut Household Curves HH with No Children 1 Person 0 and 1 Working**	**Figure 23**

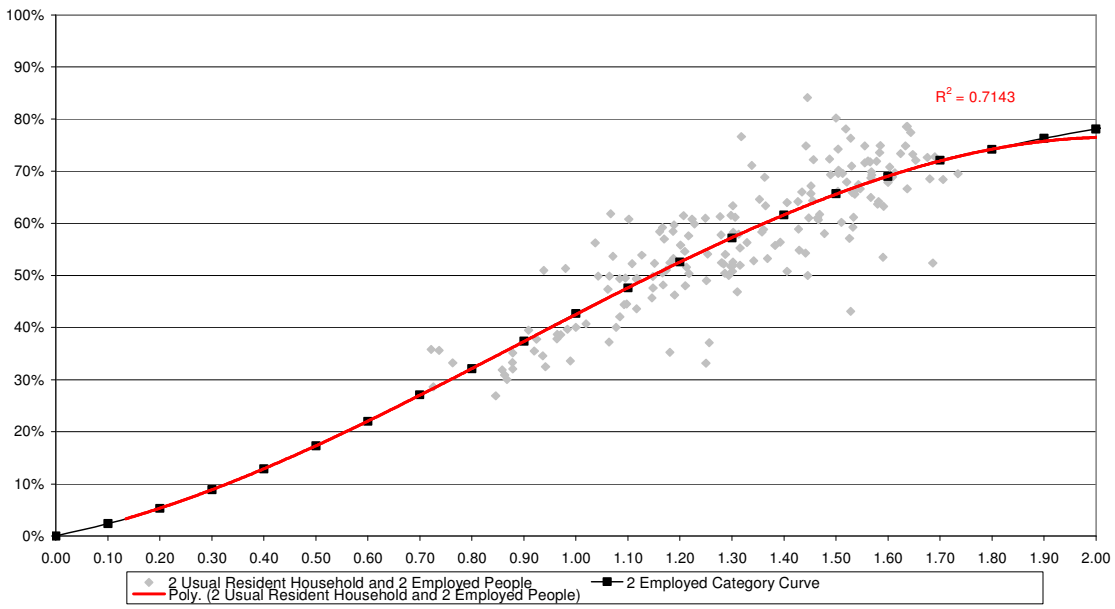
2 Person Households With 0 Persons Employed



2 Person Households With 1 Person Employed



Waikato Regional Transport Model Household Distribution Model Category Curves	**Second Cut Household Curves HH with No Children 2 Person 0 and 1 Working**	**Figure 24**



Waikato Regional Transport Model	**Second Cut Household Curves HH with No Children 2 Person 2 Working**	**Figure 25**
Household Distribution Model Category Curves		