Vehicle Roll-down Testing Guide

This guide describes how to do roll-down testing of vehicles at our surveyed site at Kennedys Bush Road near Halswell Quarry. See the map on page 6 for how to get there.

To do the roll down test you need the following bits of kit:

- Vehicle and rider to be tested
- Bath room scales
- Cycle computer on the vehicle that will record maximum speed and distance traveled.
- These charts and a ruler and pencil

The test should be done with in calm or near-calm conditions, which isn't always possible (this is where patience comes in). You should do several runs and average the results in order to reduce the error.

Procedure

Step 1: Weigh the vehicle and rider together, i.e., pick up the vehicle and stand on the scales, and record reading (in kilograms). This is the actual weight.
Step 2: Set the cycle computer speedo to zero
Step 3: From a standing start at the Calibrated Starting Point (see the final image), roll down the hill and along Kennedys Bush Road until you come to a stop.
REMEMBER NOT TO PEDAL!
(if you roll past Cashmere Road, you are doing well - this has actually been achieved)
Step 4: Record the total Roll Distance (in meters) and Maximum Speed (in km/hr) from the cycle computer.
Step 5: Repeat steps 2-4 at least three times for each vehicle configuration being tested. Discard any crazy results and average the remainder.

Remember to reweigh the bike and vehicle if any mass is added or removed, e.g., fluids added to or removed from the rider.

Once you have some sets of measurements, you can use the following charts to calculate the Effective Frontal Area and the Rolling Resistance of your vehicle:

Effective Frontal Area

Depending on how far you rolled, use Chart A1 or A2 on page 2 or 3. For each measurement, find the intersection point on the graph for the maximum speed and the roll distance. Find the two bold curves on either side of this point, and interpolate between them. For example, if the intersection point is about midway between the curves for A=0.30 and A=0.35, but is a bit closer to the A=0.3 curve, then the interpolated value would be about A=0.32.

This result must be corrected for your actual weight, so go to Chart B on page 4. Lay a ruler on the chart between your actual weight on the left axis and the A result you just estimated on the right axis, and read off the corrected A result from where the ruler crosses the middle axis.

Rolling Resistance

Use Chart C. For each measurement, find the intersection point on the graph for the maximum speed and the roll distance. Find the two bold curves on either side of this point, and interpolate between them, e.g., if the intersection point is about midway between the curves for Cr=0.006 and Cr=0.008, then the interpolated value would be about Cr=0.007.

This result does not need to be corrected for actual weight.

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Chart A1 - Calculating Effective Frontal Area (m^2)

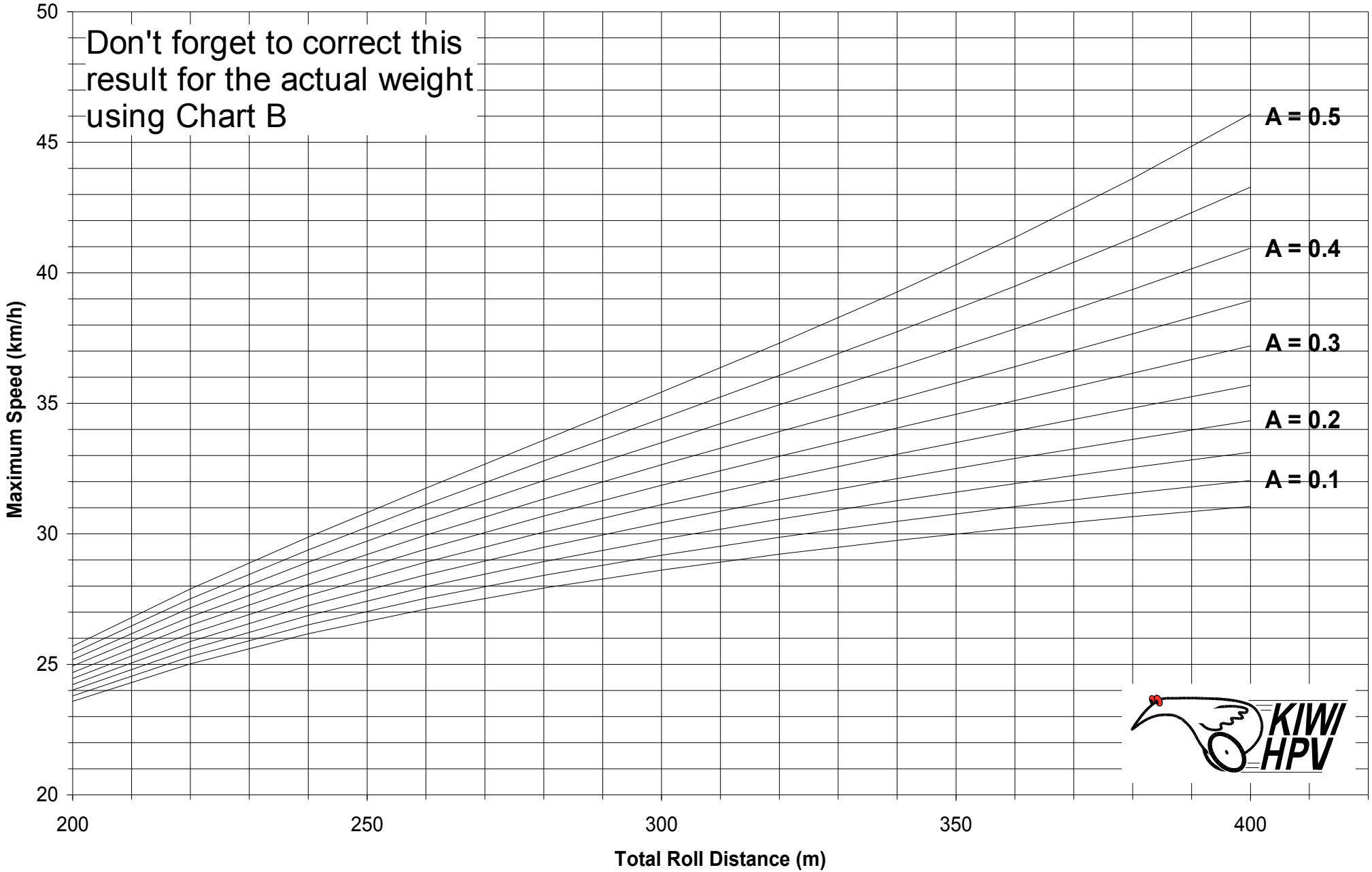


Chart A2 - Calculating Effective Frontal Area (m^2)

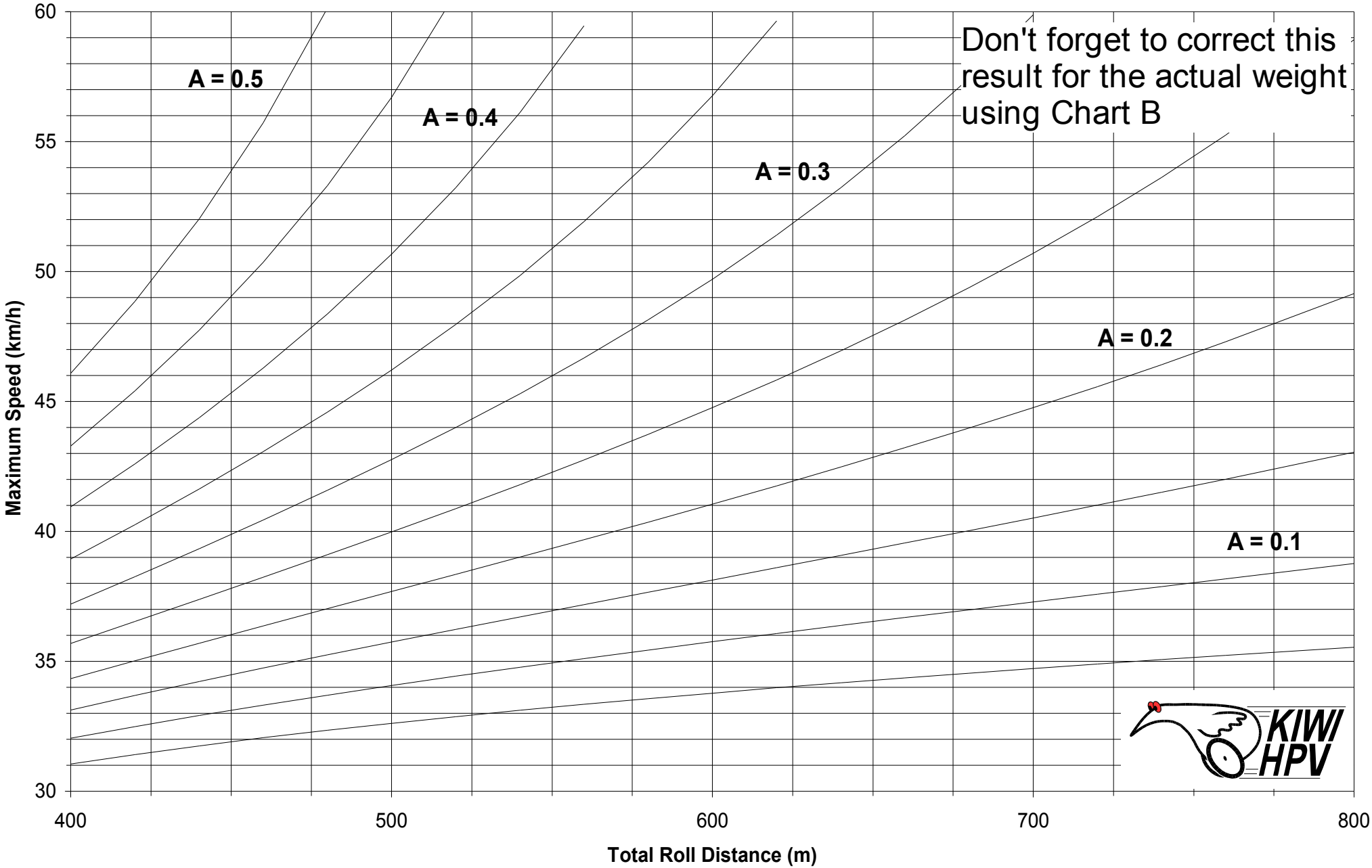


Chart B – Correcting Frontal Area Results for Actual Weight

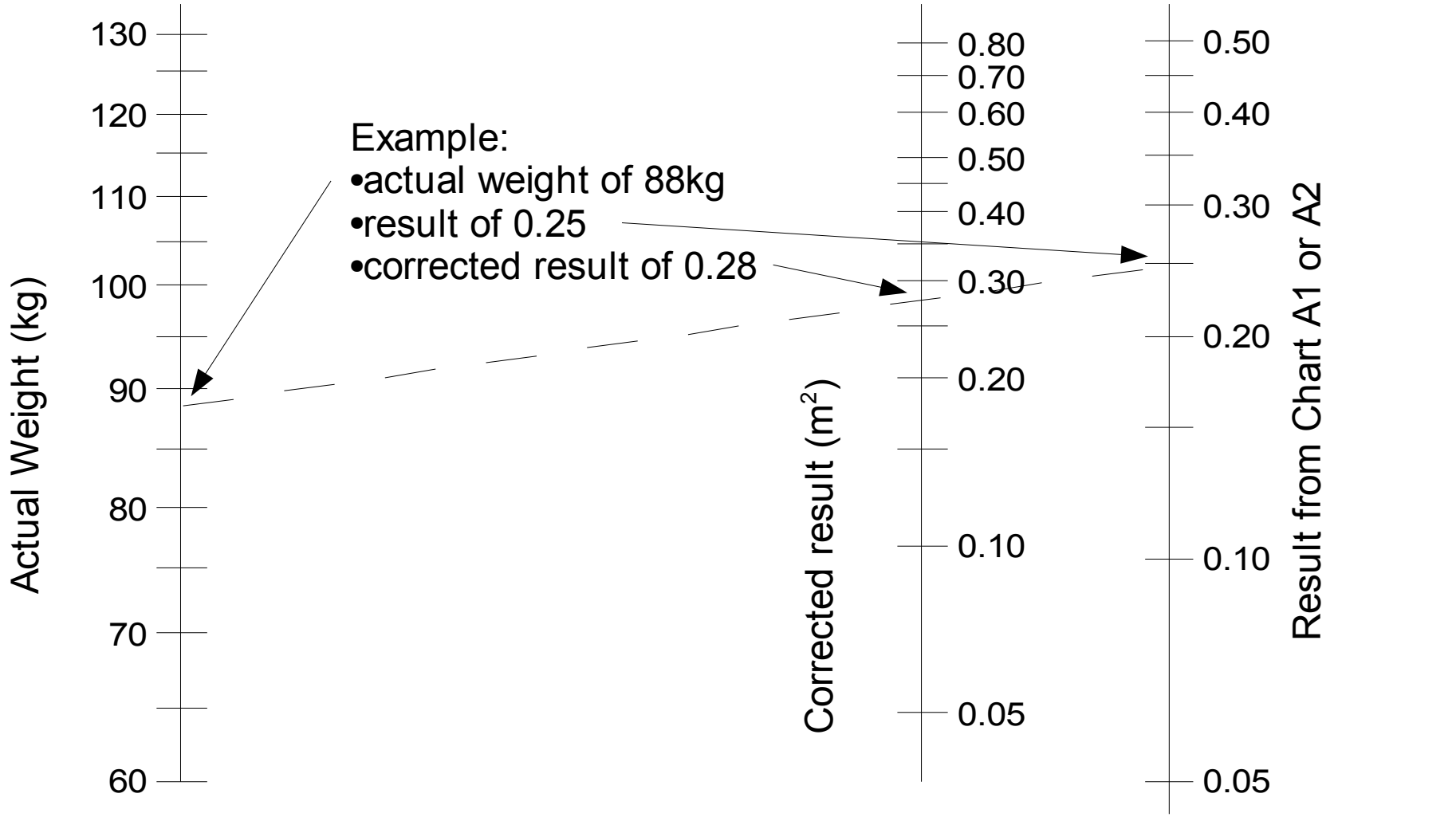
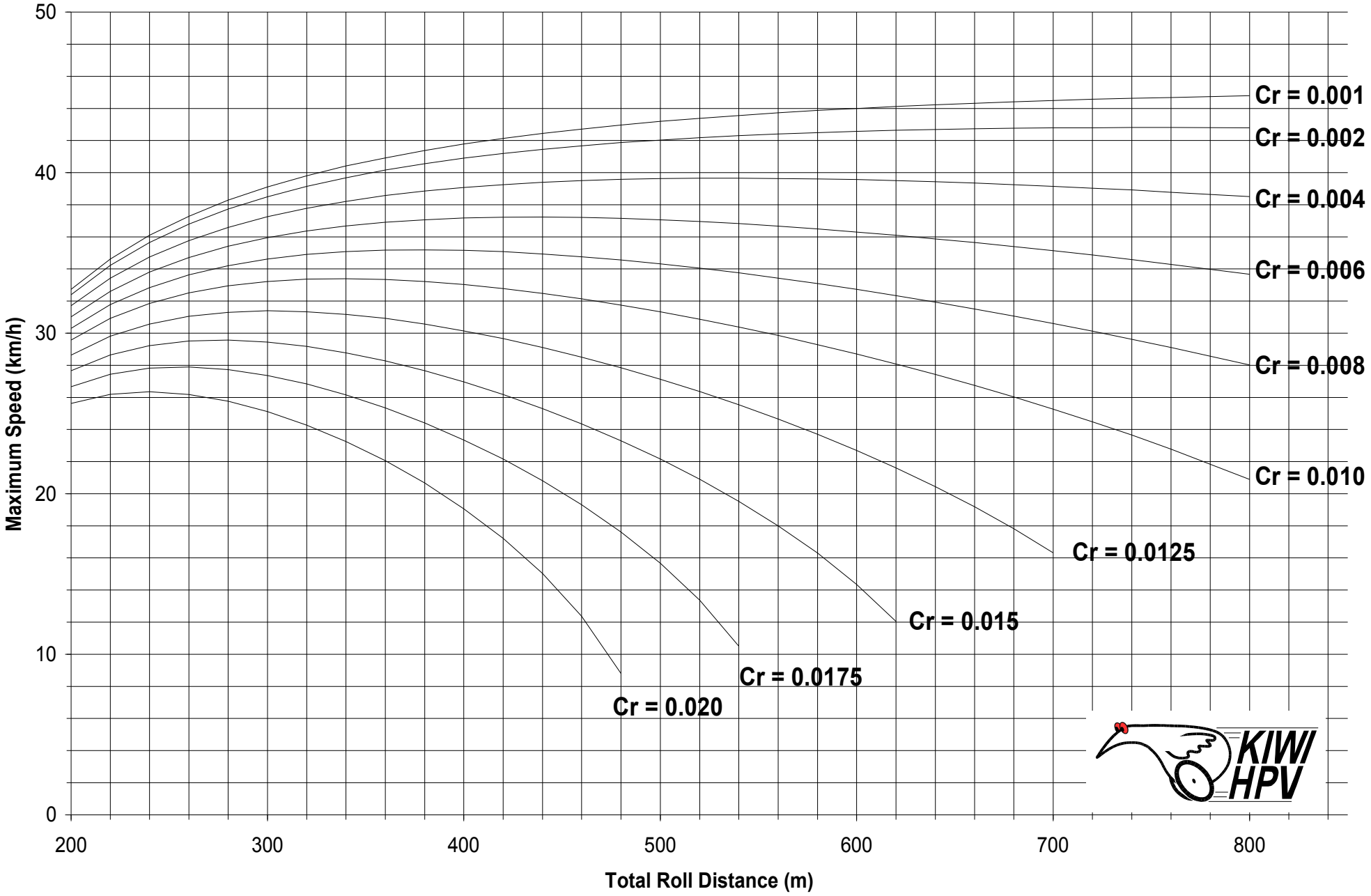
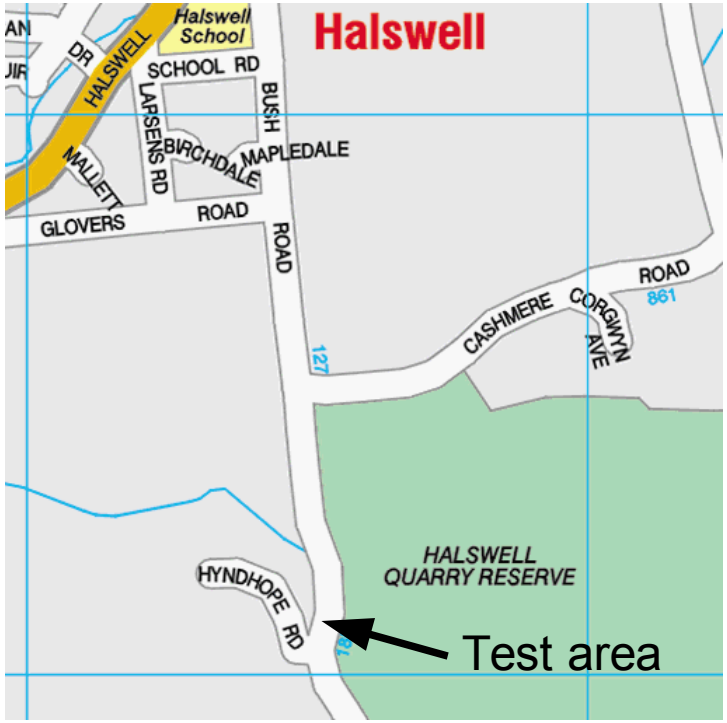


Chart C - Calculating Rolling Resistance



How to get there

The roll down site is just at the entrance to the Halswell Quarry, as shown in the map below.



When you are using the roll-down site, remember that it is a public road, and take care. Hyndhope Common is a handy place to do repairs and changes, or to have a drink and a snack and enjoy the sunshine when you are finished.

One of the best times to use this site is early in the morning on a weekend, before any significant wind comes up, and before there is much traffic.