Safety From a Roading Perspective
Heavy Combination Vehicles – Road Space Usage and Curve Design

Hawkes Bay Heavy Transport Forum
5th September 2012


CARRIER
Hall's
INTERMODAL
Hall's
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Hall's
Refrigerated Transport
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TARE
5290 kgs
GROSS
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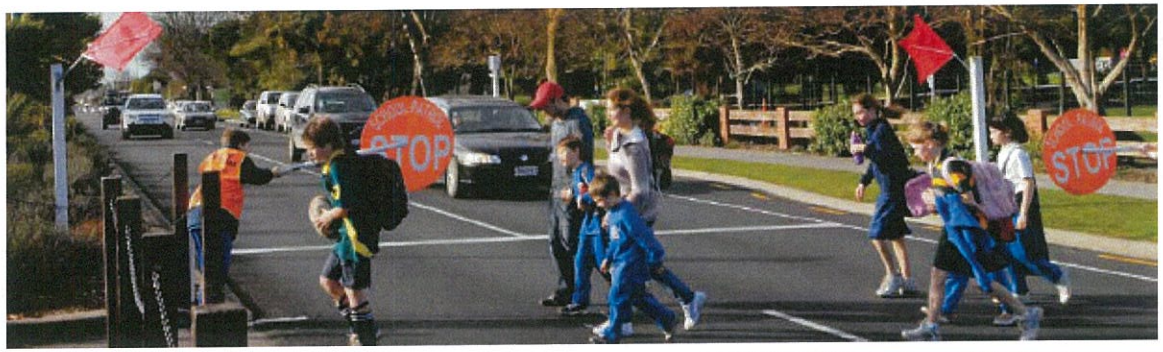
Hall's
Refrigerated Transport
at temperature, on time, any weight, anywhere
TRA9306


Shell
Shell


HOOKER
Shell
Shell


H

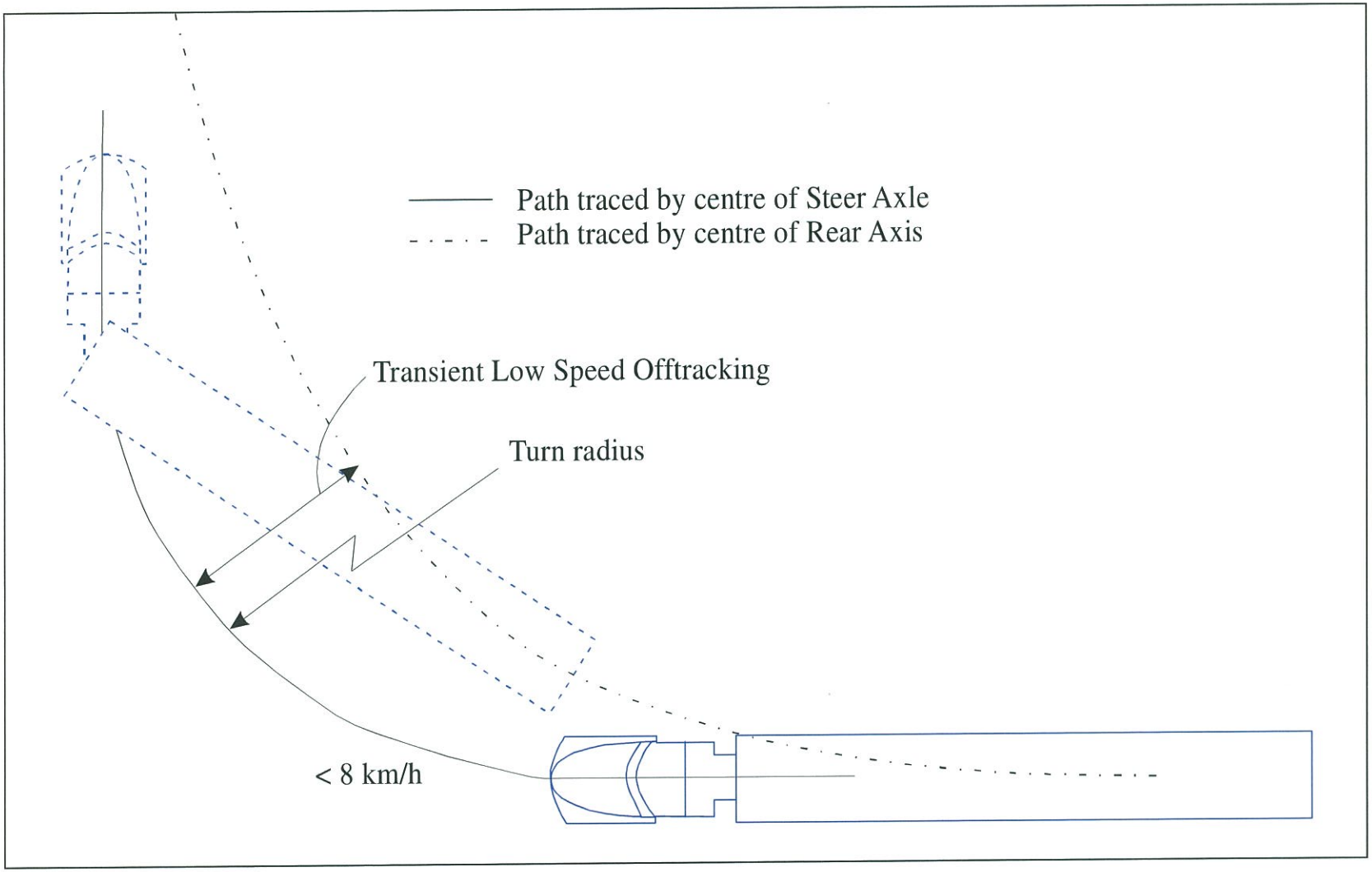
Introduction



Road Space Usage

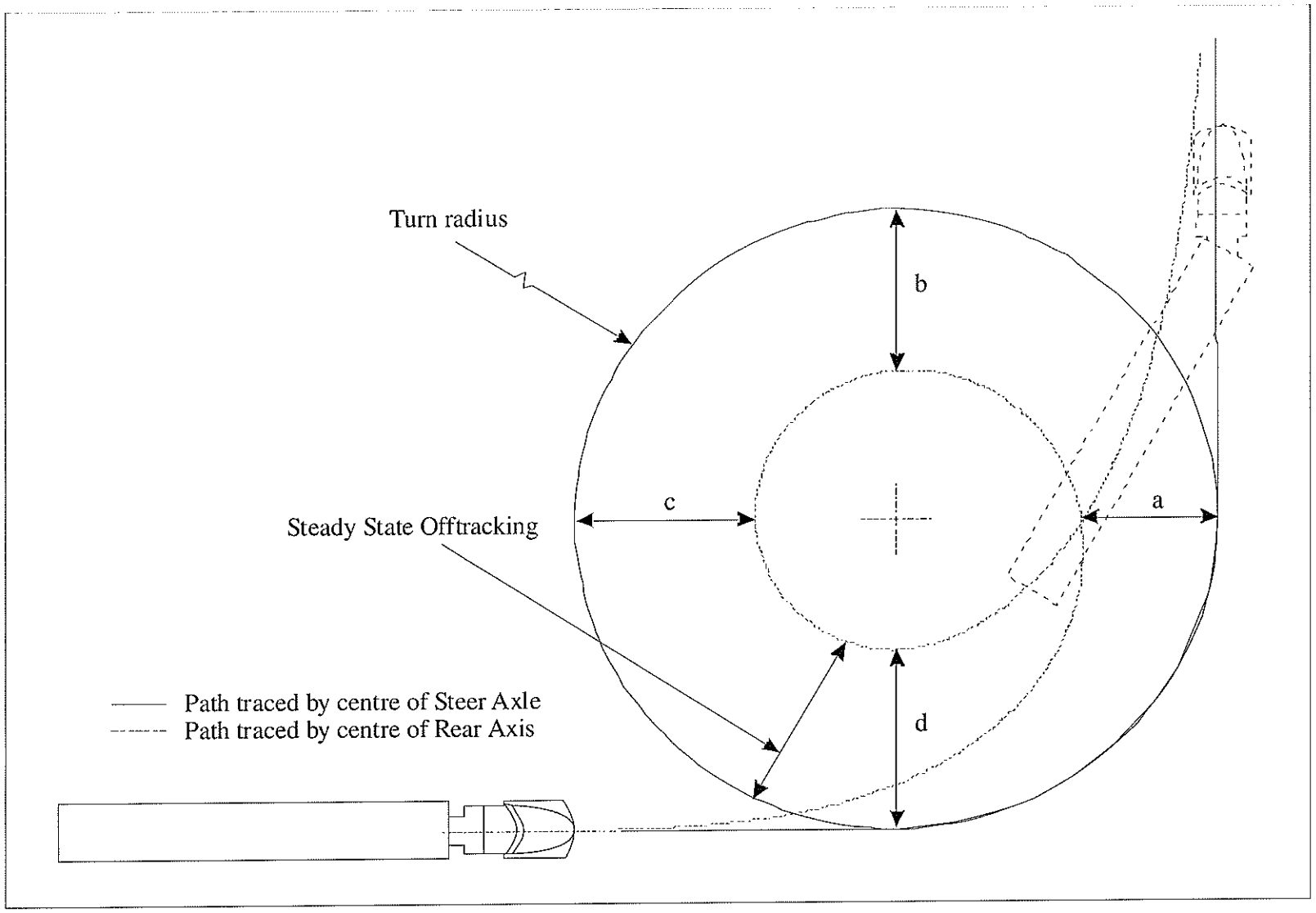
- Offtracking and Swept Path (road space usage)
  - Low speed
    - » Curve radius
    - » Super elevation
    - » Vehicle type and dimensions
  - High speed
    - » Speed
    - » Curve radius
    - » Super-elevation
    - » Vehicle type and dimension

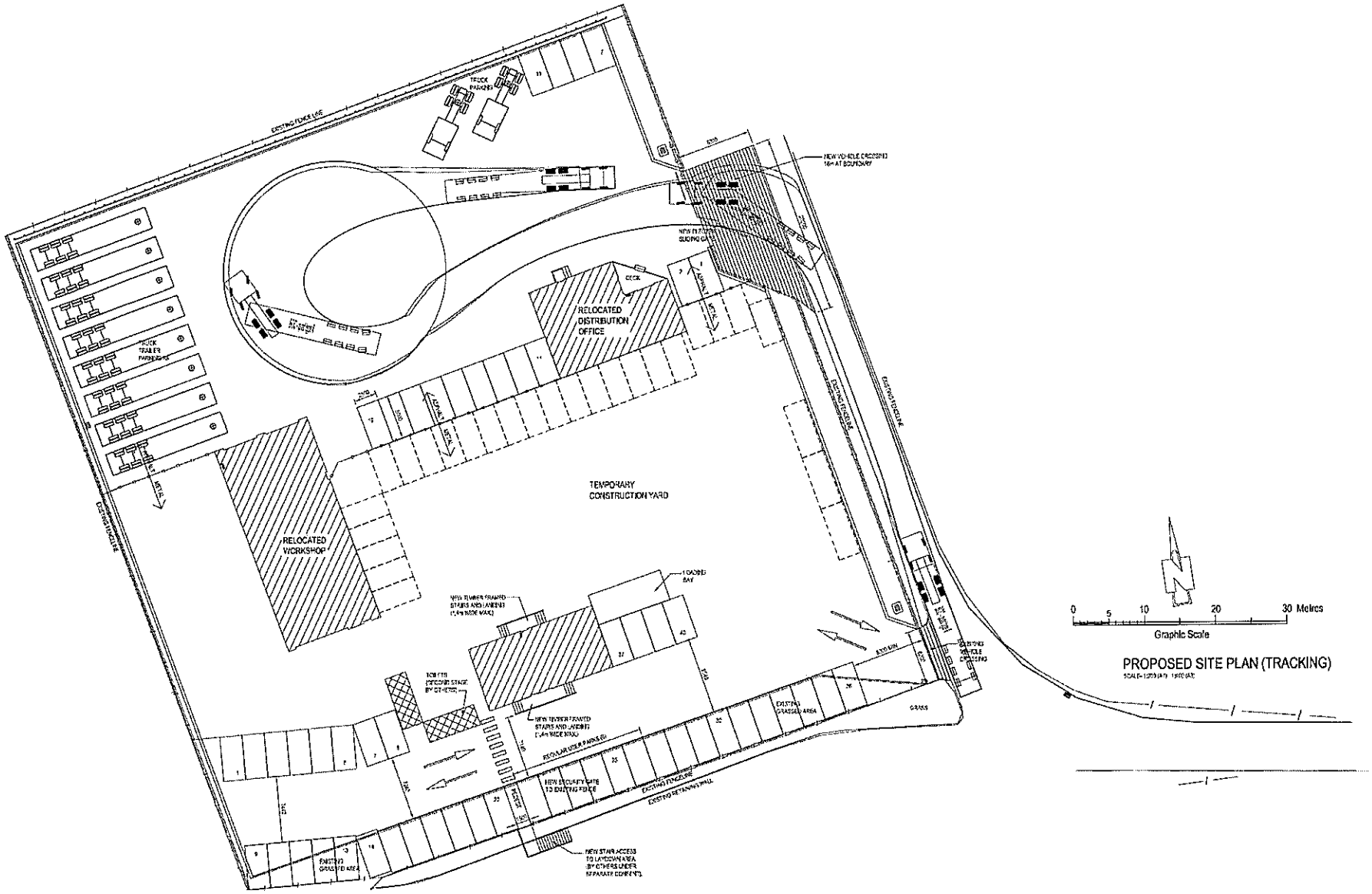
➢Low speed offtracking



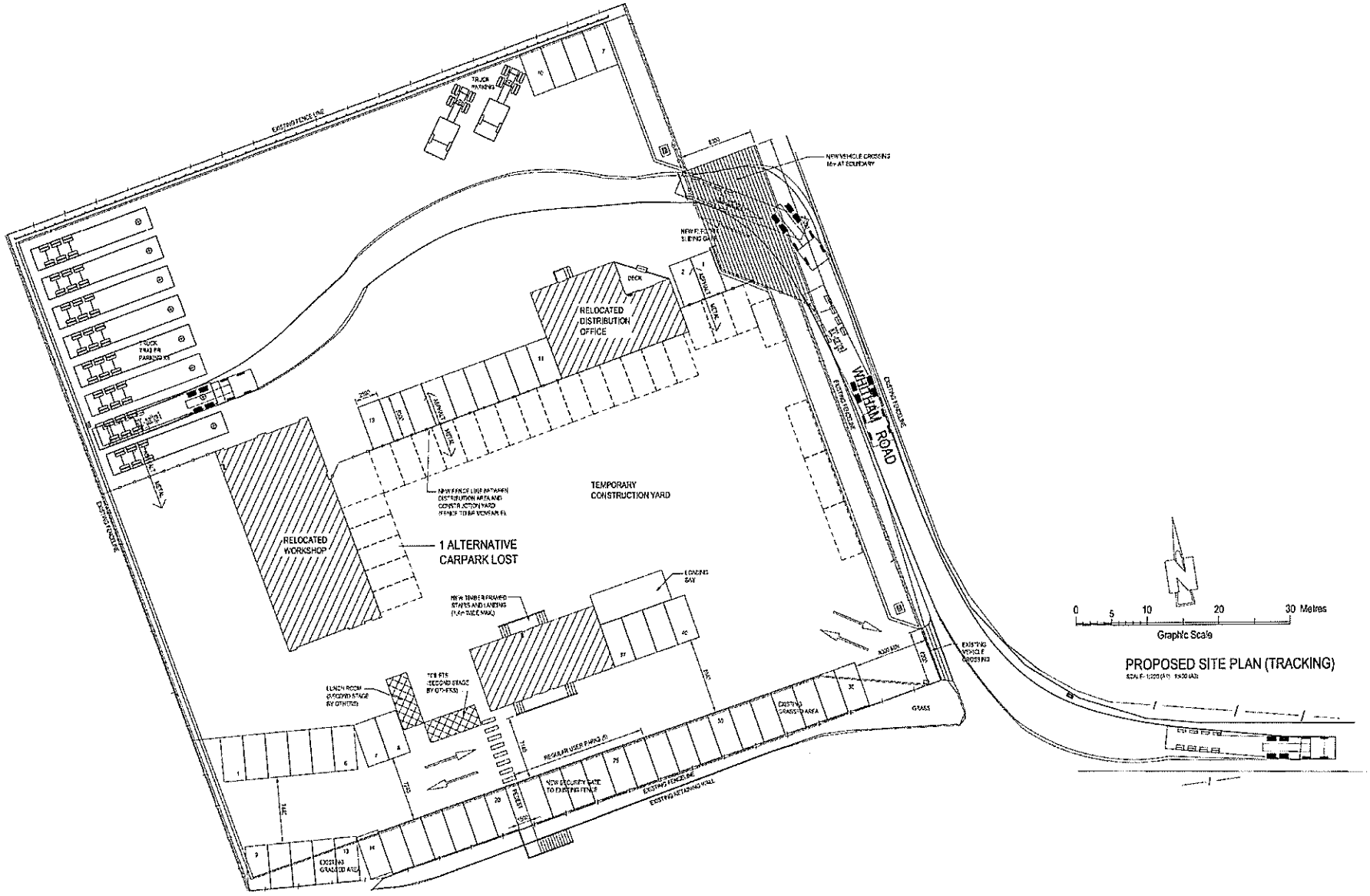
For steady state offtracking turn radius of over 450° required

➢Low speed offtracking



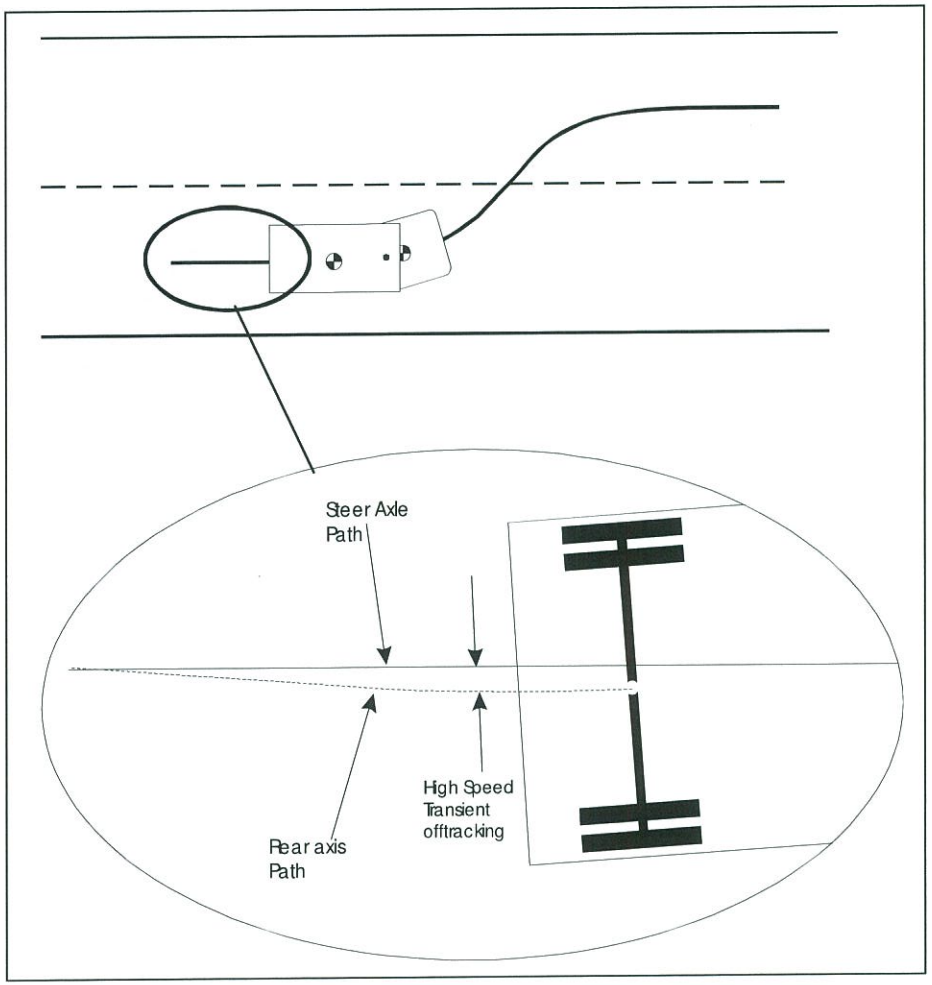


PROPOSED SITE PLAN (TRACKING)

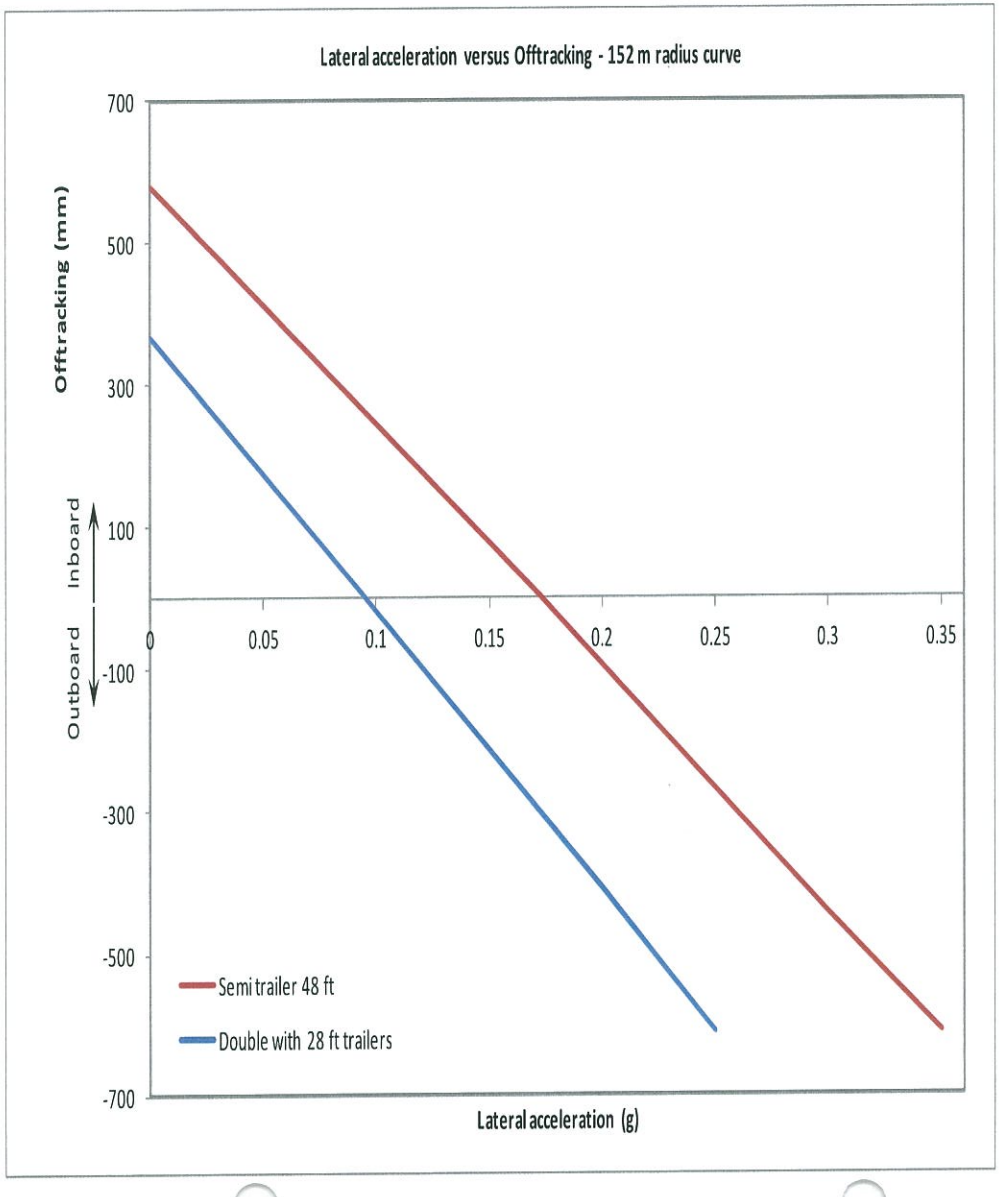

RELOCATED DISTRIBUTION OFFICE
TEMPORARY CONSTRUCTION YARD
RELOCATED WORKSHOP
1 ALTERNATIVE CARPARK LOST
WILLIAM ROAD
0 5 10 20 30 Metres
Graphic Scale
PROPOSED SITE PLAN (TRACKING)

➢ High speed offtracking

- Can be inboard or outboard offtracking
- Outboard offtracking will occur in high-speed manoeuvres
- Heavy vehicle travelling on a straight road will offtrack or 'hang down the road'



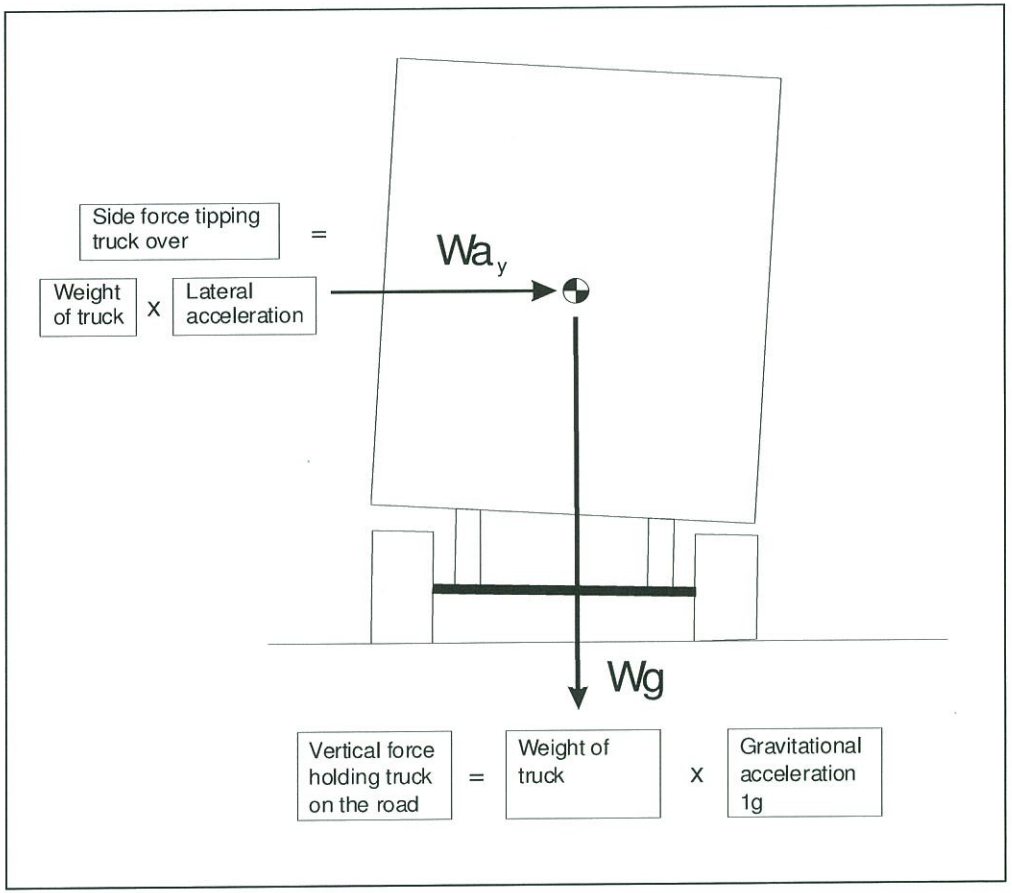
- High speed offtracking



Rollover - Static Rollover Threshold (SRT)

The maximum amount of lateral (sideways) acceleration a heavy vehicle can withstand without rolling over

Depends on speed, curve radius, superelevation and vehicle factors

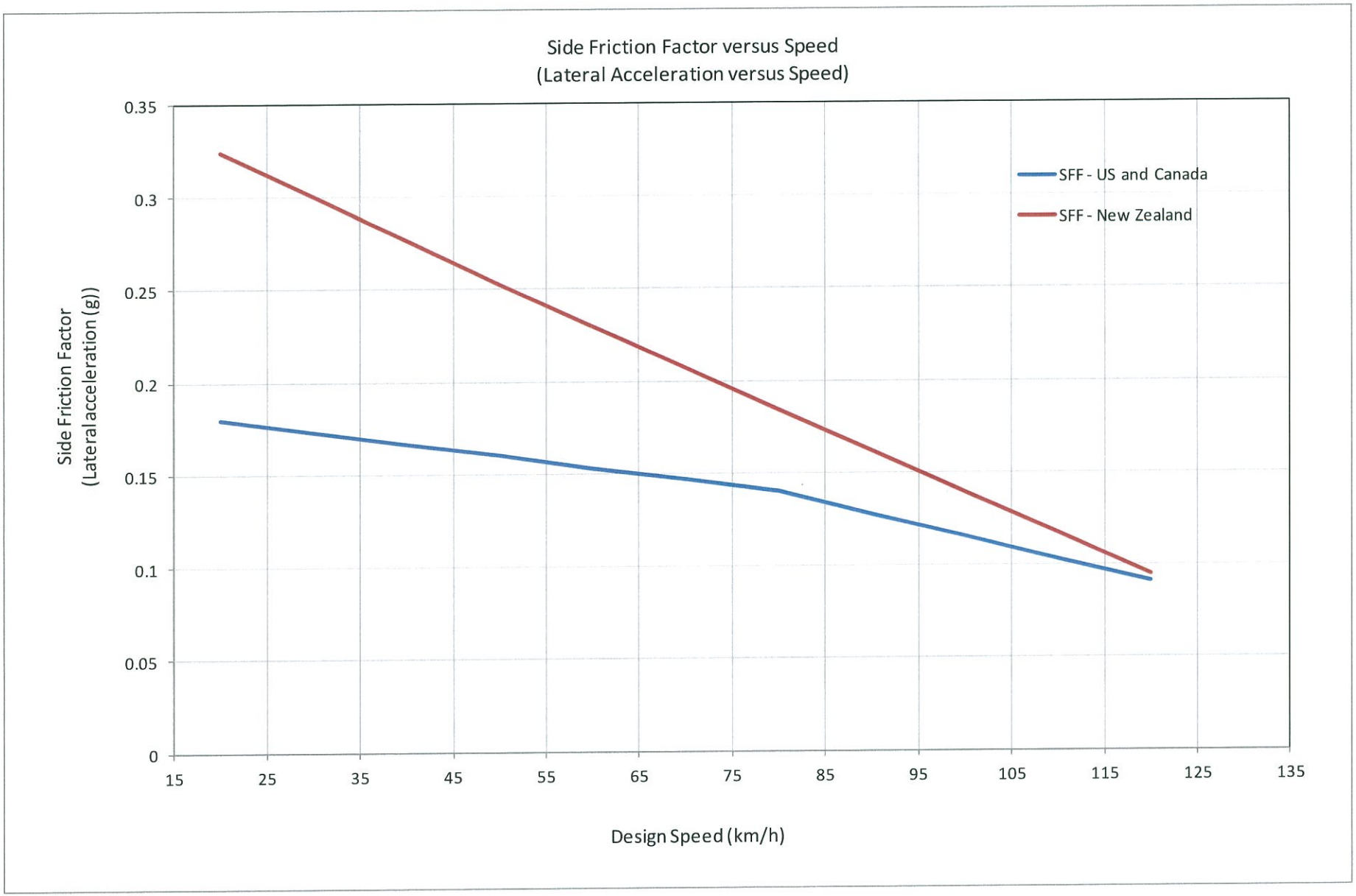


SRT is equivalent to the tangent of the angle at which all wheels lift off on one side of vehicle in a tilt table test

Cornering Characteristics of HV

- Speed surveys of laden heavy vehicles on posted advisory speed curves showed that:
  - Laden heavy combination vehicles travelled through on average 11% faster than the posted advisory speed
  - This reduced to 6% above the posted advisory speed for high centre of gravity vehicles
- Analysis of lateral acceleration data recorded from a line haul b-train combination showed that:
  - On average three to four cornering events above 0.22 g were recorded on a return trip from Auckland to Wellington
- Analysis of speed and position data from electronic hubodometers revels that:
  - The average cornering speed is at or above the posted advisory speed
  - Average speeds giving rise to lateral accelerations above 0.2g were recorded on all curves of 200 metres radii and less

Cornering Characteristics of HV



From the equation for theoretical (measured) advisory speed the underlying relation between lateral acceleration and advisory speed can be extracted.

Advisory Speed (km/h)	Lateral acceleration (g)
35	0.28
45	0.26
55	0.24
65	0.21
75	0.19
85	0.17

31	0.30

Survey speed (V_o) = 24 km/h

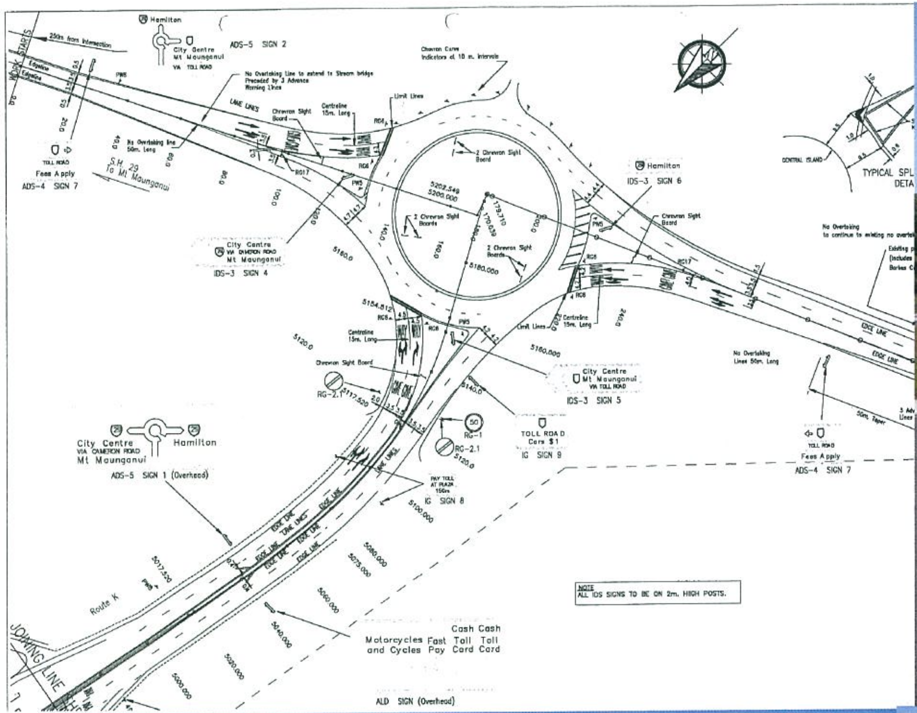
Ball bank reading (B) = 8

Measured advisory speed (V_m) = 31 km/h (From Figure 3.1, Appendix A3, MOTSAM)

Rounded advisory speed = 35 km/h

A vehicle travelling on this curve at 35 km/h would experience a lateral acceleration of 0.38g. This is higher than the minimum SRT requirement for heavy vehicles.

I.e. A HV with a SRT of 0.35 g would rollover in this corner while travelling at the advisory speed.


Hamilton
City Centre
Mt Maunganui
VIA TOLL ROAD
ADS-5 SIGN 2
Toll Road
Fees Apply
ADS-4 SIGN 7
S.H. 29
To Mt Maunganui
City Centre
VIA CAMERON ROAD
Mt Maunganui
IDS-3 SIGN 4
Hamilton
IDS-3 SIGN 6
City Centre
Mt Maunganui
VIA TOLL ROAD
IDS-3 SIGN 5
TOLL ROAD
Cars $1
IG SIGN 9
City Centre
VIA CAMERON ROAD
Mt Maunganui
Hamilton
ADS-5 SIGN 1 (Overhead)
IG SIGN 8
TYPICAL SPL
DETA
NOTE
ALL IDS SIGNS TO BE ON 2m. HIGH POSTS.
Route K
JOINING LINE
Cash Cash
Motorcycles Fast Toll Toll
and Cycles Pay Card Card
ALD SIGN (Overhead)


K
TOLL ROAD
25
ISUZU