

Engineering Safety Solutions

KiwiRail

Muri Station Risk Assessment Report

Appendix B

Muri Station Step Distance Review Report

Version 1 – 18/1/10



**Muri Station Step Distance
Review
WRRP 607
KiwiRail**

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Contents

1.	Introduction	1
2.	Muri Station Description	1
3.	Relevant Standards and Reports	1
3.1	New Zealand	1
3.2	United Kingdom	1
3.2.1	Railway Group Standard GI/RT7016	1
3.2.2	Significant Steps Research	2
3.3	Australia	2
4.	Muri Station Stepping	3
4.1	Muri Step Distances	3
4.2	Comparison with Other NIMT/Hutt Stations	4
4.3	Comparison with Standards/Guidance	5
5.	Improving the Muri Step Distance	7

Appendix A

Muri Station Aerial and Photos

Appendix B

Muri Step Distance Graphs

Appendix C

Part UK Railway Group Standard GI/RT7016

Appendix D

Muri Station Train Position Drawings

1. Introduction

This document reviews the step distances at Muri Station with other stations on the NIMT/Hutt network and with international standards.

2. Muri Station Description

Muri Station consists of two opposing platforms separated by double tracks, refer to the aerial photo and photographs included in Appendix A.

The Up Main consists of 120m of concrete frontage with an asphalt surface and a 52m section of timber deck supported on steel piles.

The Down Main consists of 165m of concrete frontage with an asphalt surface.

The station is located on a transition between two track curves the lightest of which at the western end (towards Wellington) has a radius of approximately 200m. The track centreline separation through Muri Station varies between 3.56m and 3.89m within the platform limits and averages 3.70m.

Train stopping locations at Muri Station are shown on the drawings in Appendix D.

3. Relevant Standards and Reports

3.1 New Zealand

There is no definitive New Zealand guidance on step distances for passengers at platform/train interfaces.

With the introduction of the Matangi unit in the Wellington area the step distance on a straight platform which complies with the standard structure gauge will be;

Horizontal	140mm
Vertical	50mm
Diagonal	148mm

The significant number of platforms constructed on curved track sections means that in many cases these distances will be greater to allow for the effects of vehicle throw and cant.

3.2 United Kingdom

3.2.1 Railway Group Standard GI/RT7016

Similar to the Wellington network there are numerous examples in the UK of mixed vehicle and mixed use (passenger and freight) rail lines. The recently revised Railway Group Standard GI/RT7016 (December 2009) gives the following guidance on step distances for new trains.

Horizontal	275mm
Vertical	250mm
Diagonal	350mm

The relevant section of GI/RT7016 is included in Appendix C. These dimensions are also used in Network Rails Track Design Handbook NR/L2/TRK/2049 Section A.8.13 Platform Structure Standards.

3.2.2 Significant Steps Research

The UK Department of Transport has also undertaken research into the area of stepping distances from trains and produced a set of documents entitled 'Significant Steps'. The summary document produced for this research provides the following recommendations;

Optimum stepping	horizontal + vertical dimensions = less than 200mm
Maximum stepping	horizontal + vertical dimensions = less than 300mm

During the research measurements were taken on 25 existing stations in the UK. Of those only 3 were within the 200mm dimension and 7 within the 300mm maximum recommended.

This research also showed that a step up into the train from the platform is significantly better than a step down into the train.

3.3 Australia

There is no definitive national requirement for stepping distances in place across Australia and requirements vary from state to state. General guidance on passenger networks is to provide a step distance with a diagonal distance of 200mm or less.

4. Muri Station Stepping

4.1 Muri Step Distances

The step distance at Muri Station once the Matangi is introduced is shown on the graphs below which are also included in Appendix B.

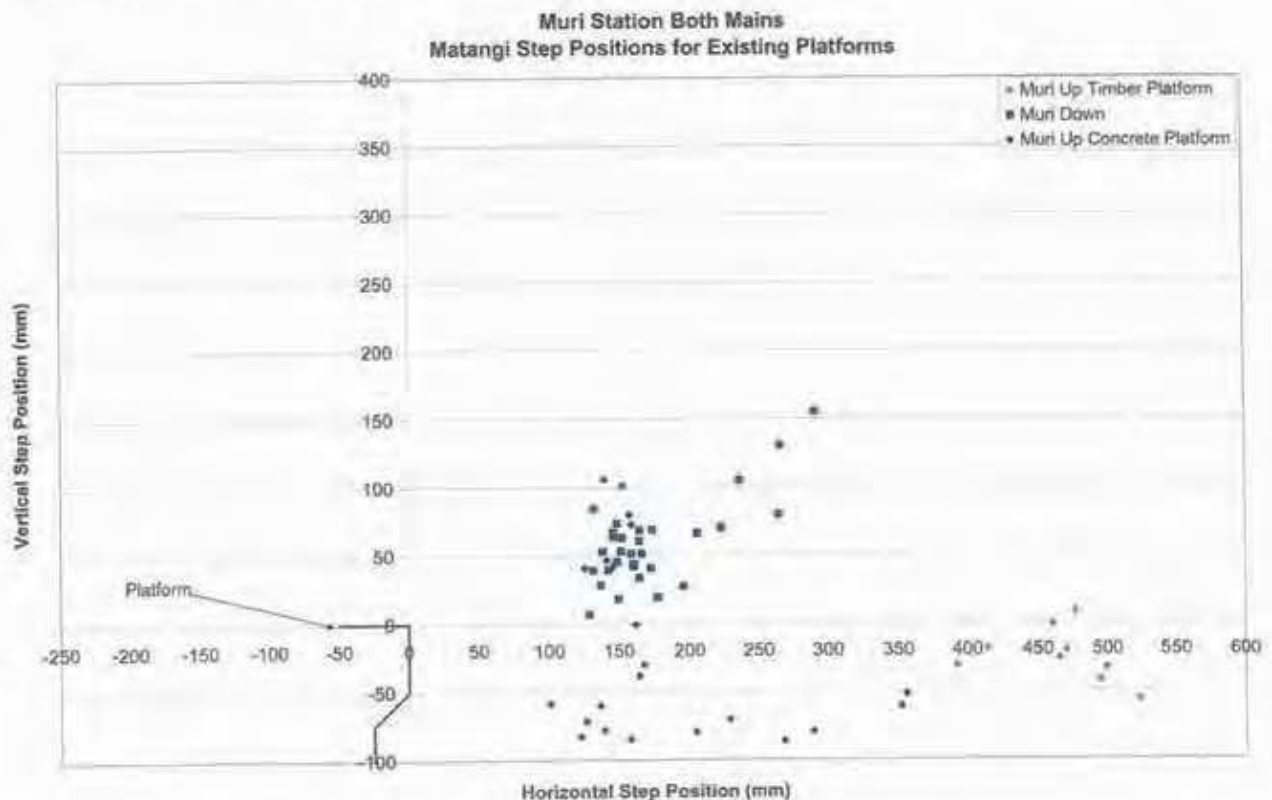


Figure 4-1: Muri Station Platforms Matangi Step Distance Graph

The Table 4-1 below gives the range of step distances on each platform

Platform	Horizontal	Vertical	Diagonal
Up Main (concrete) (120m)	100mm to 350mm	-85mm to 105mm	120mm to 365mm
Up Main (timber) (50m)	390mm to 525mm	-55mm to 5mm	400mm to 530mm
Down Main (165m)	130mm to 300mm	5mm to 160mm	135mm to 320mm

Table 4-1: Muri Station step distance ranges vs Matangi (bold figures indicate measurements outside of Railway Group Standard GI/RT7016 guidance)

The Down Main step distances are generally good with less than 200mm horizontal and 100mm vertical distances. However, the graph shows the Up Main as having the majority of the length with a step up to the platform and with very large horizontal gaps particularly along the timber platform section. Part of the reason for the large step is that the station is located on a tight curve which along with the requirement for passing freight traffic requires additional clearance to be added for train vehicle movements.

4.2 Comparison with Other NIMT/Hutt Stations

When compared to other stations on the NIMT/Hutt network the station at Muri shows up as having significantly worse step distances as can be seen from the Figure 4-2 below.

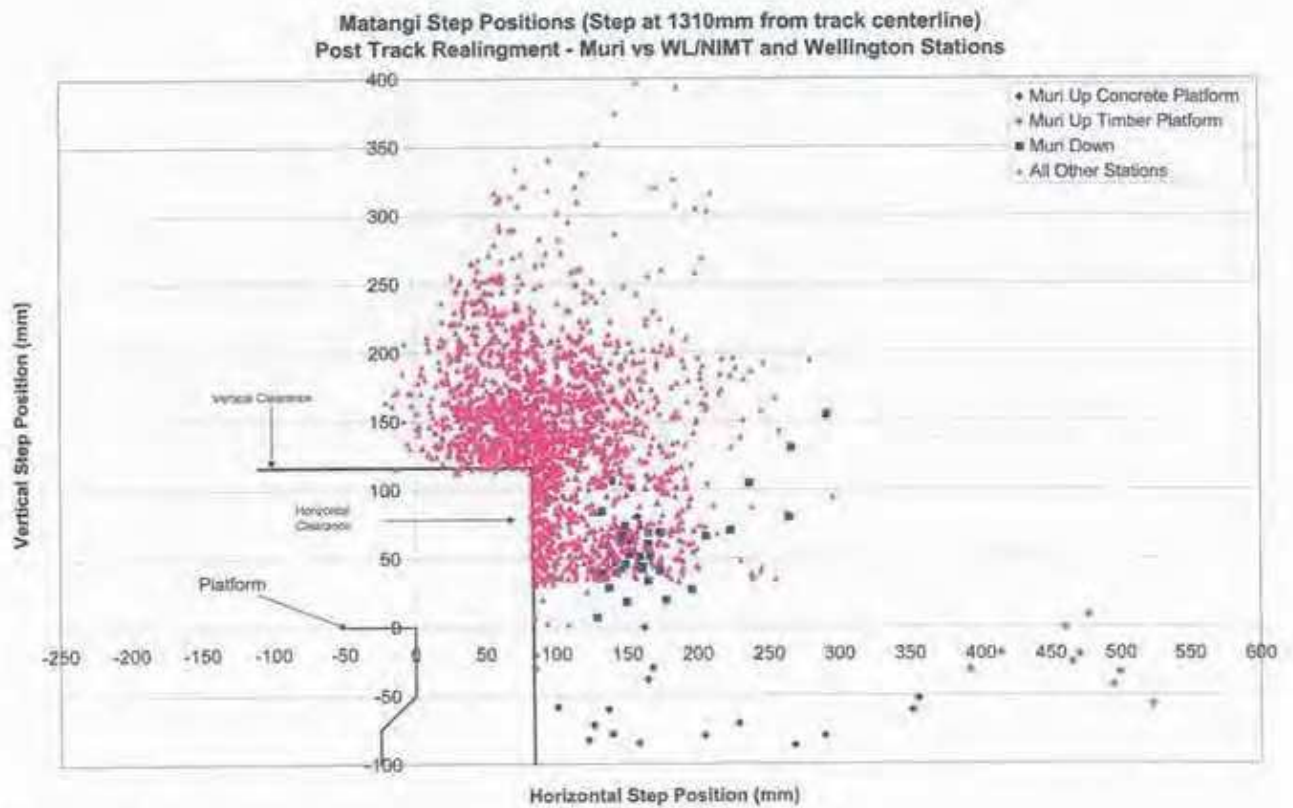


Figure 4-2: Muri Station Matangi Step Distance compared with NIMT/Hutt stations

Muri Up Main is the only platform with step down into the train along most of its length. When combined with the large horizontal distances this gives a very poor stepping position.

The majority of the Muri Down platform has good stepping distances. These distances get larger towards the Wellington end of the platform.

4.3 Comparison with Standards/Guidance

The following two graphs show the step distances compared with the UK standards and recommendations from the Railway Group Standard GI/RT7016 (December 2009) and also the UK Department of Transport 'Significant Steps' guidelines.

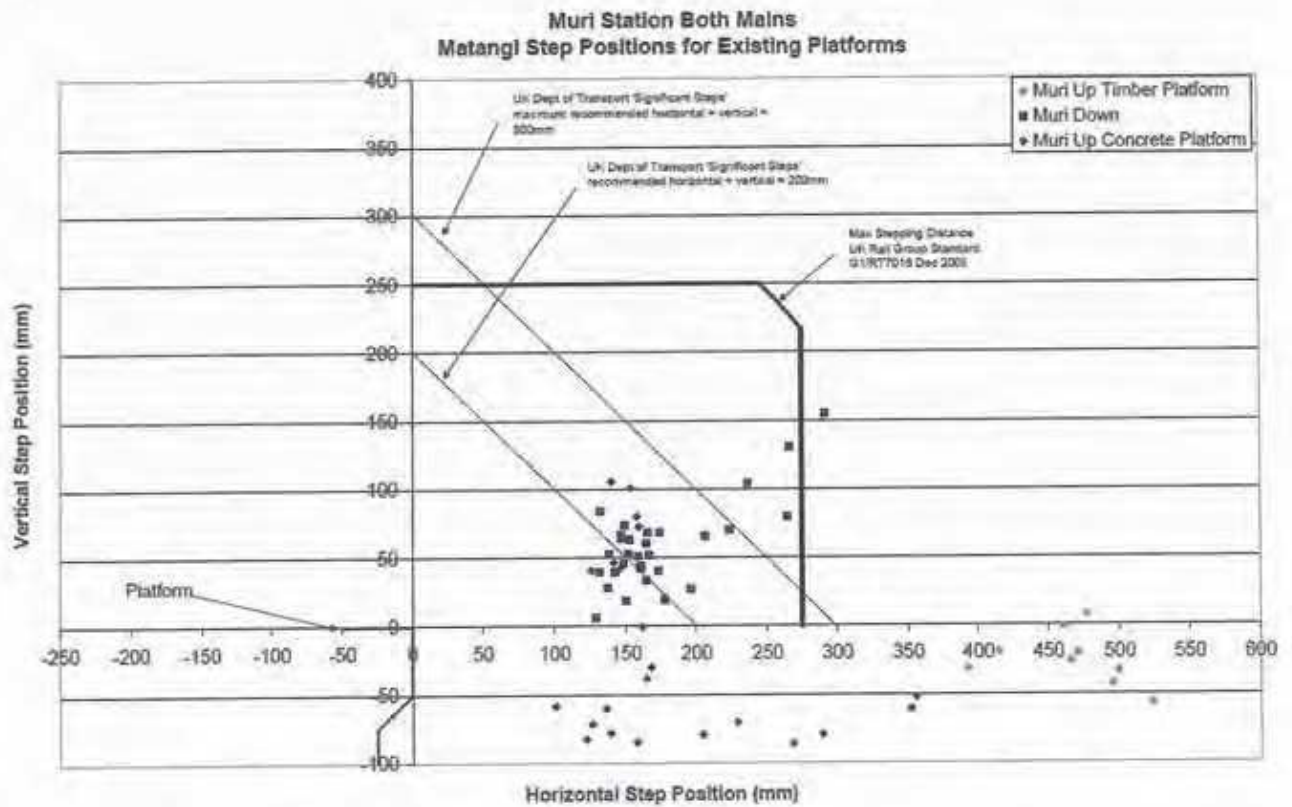


Figure 4-3: Muri Station step distances compared with UK Standards and recommendations

Muri Down Main falls within the UK standards for the majority of its length with only one point outside of the GI/RT7016 envelope.

The Up Main falls outside of the envelopes for the majority of its length primarily due to the step being below the platform and the curve along the timber section leading to very large horizontal distances.

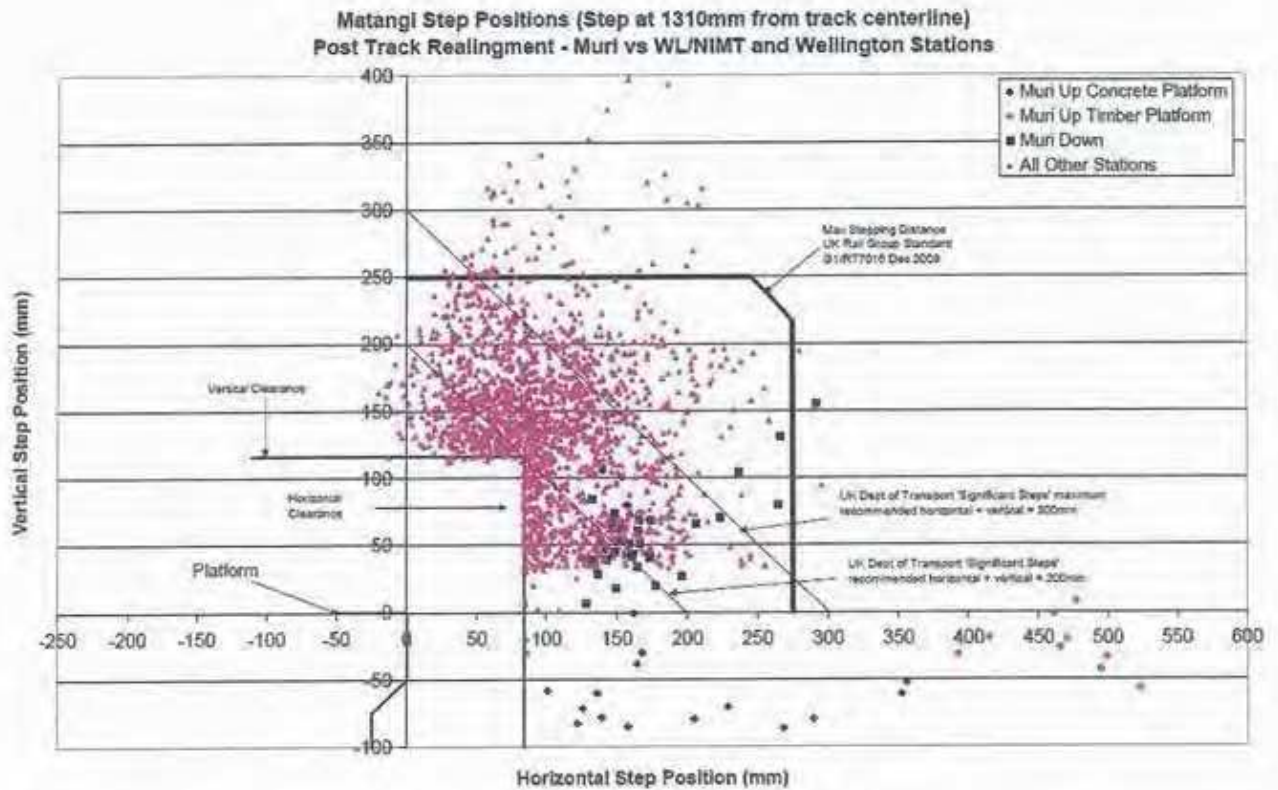


Figure 4-4: Muri Station and all NIMT/Hutt stations compared with UK Standards and recommendations

Figure 4-4 above shows Muri Station and the Up Main in particular to be an outlier among the NIMT and Hutt stations. Across the network there is a high level of compliance with the UK standards and recommendations with non conformances generally relating to vertical step. Muri is the only station with large horizontal non conformance and this is combined with negative vertical steps.

5. Improving the Muri Step Distance

At present the platforms at Muri Station do not meet the KIWIRAIL T200 structure gauge requirements and the track centrelines are closer than would be permitted. If Muri Station were to be reconstructed in its current location to meet the T200 Structure Gauge and modifications were made to the track to improve the track centre spacing the best stepping that could be achieved is shown in Figure 5-1 below.

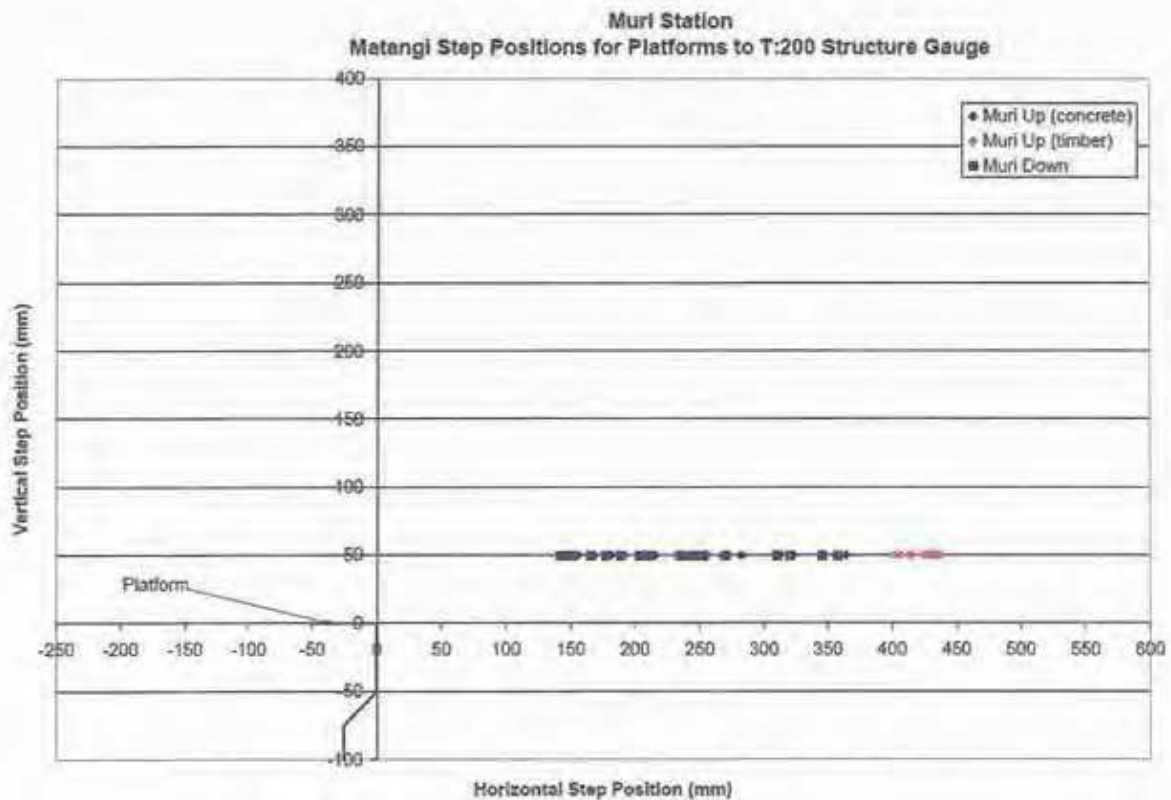


Figure 5-1: Muri best achievable step

The graph indicates that while the vertical step is improved along the whole station, the horizontal step remains large in particular along the timber section of the Up Main. This is due to the track geometry with the station located on a tight curve at the Wellington end.

To improve step distance in the horizontal dimension would require the station to be relocated.

Appendix A
Muri Station Aerial and Photos

Appendix A





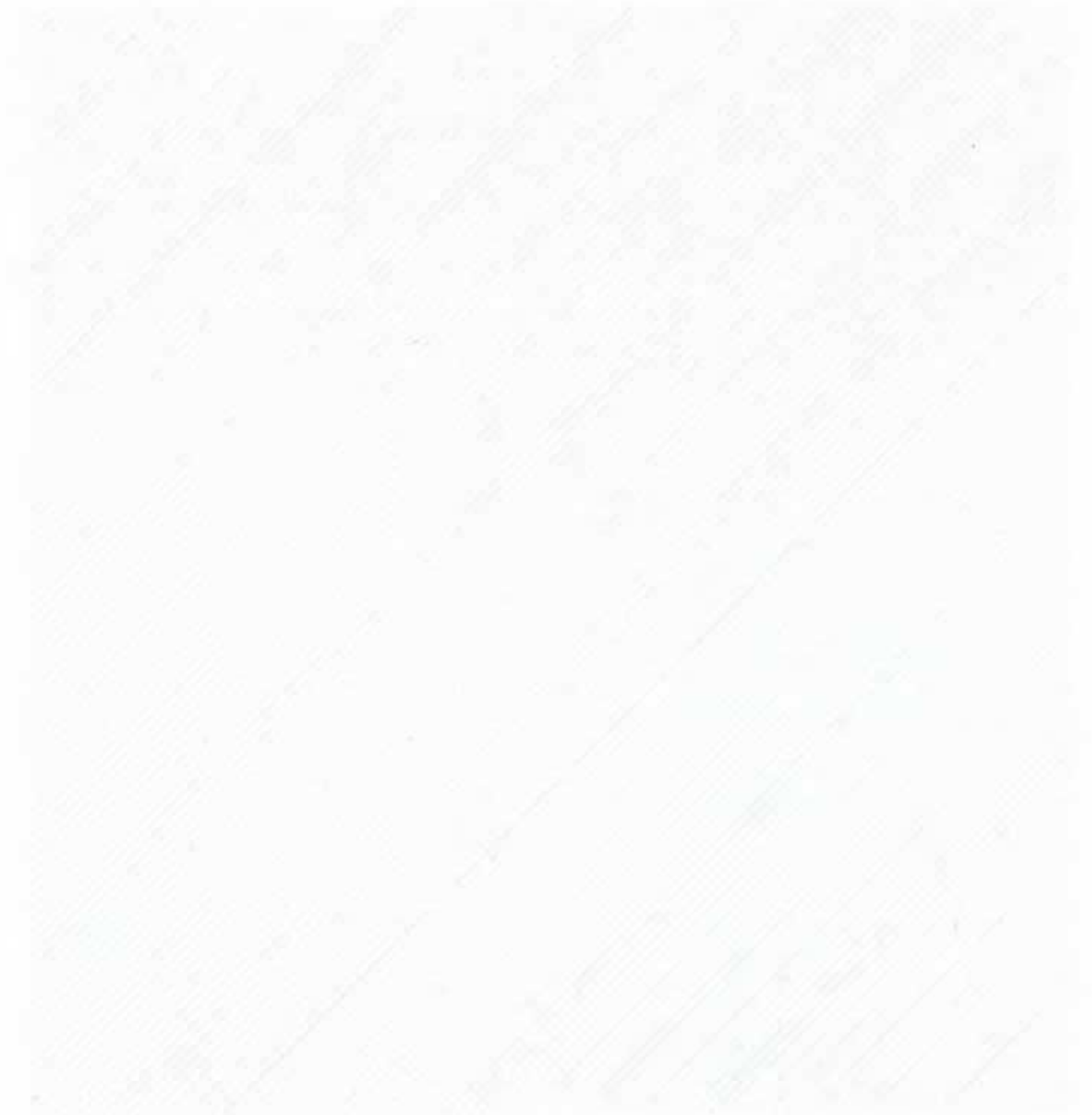
Photo 1: Looking southeast with the Up main on the left with the timber deck section in the foreground



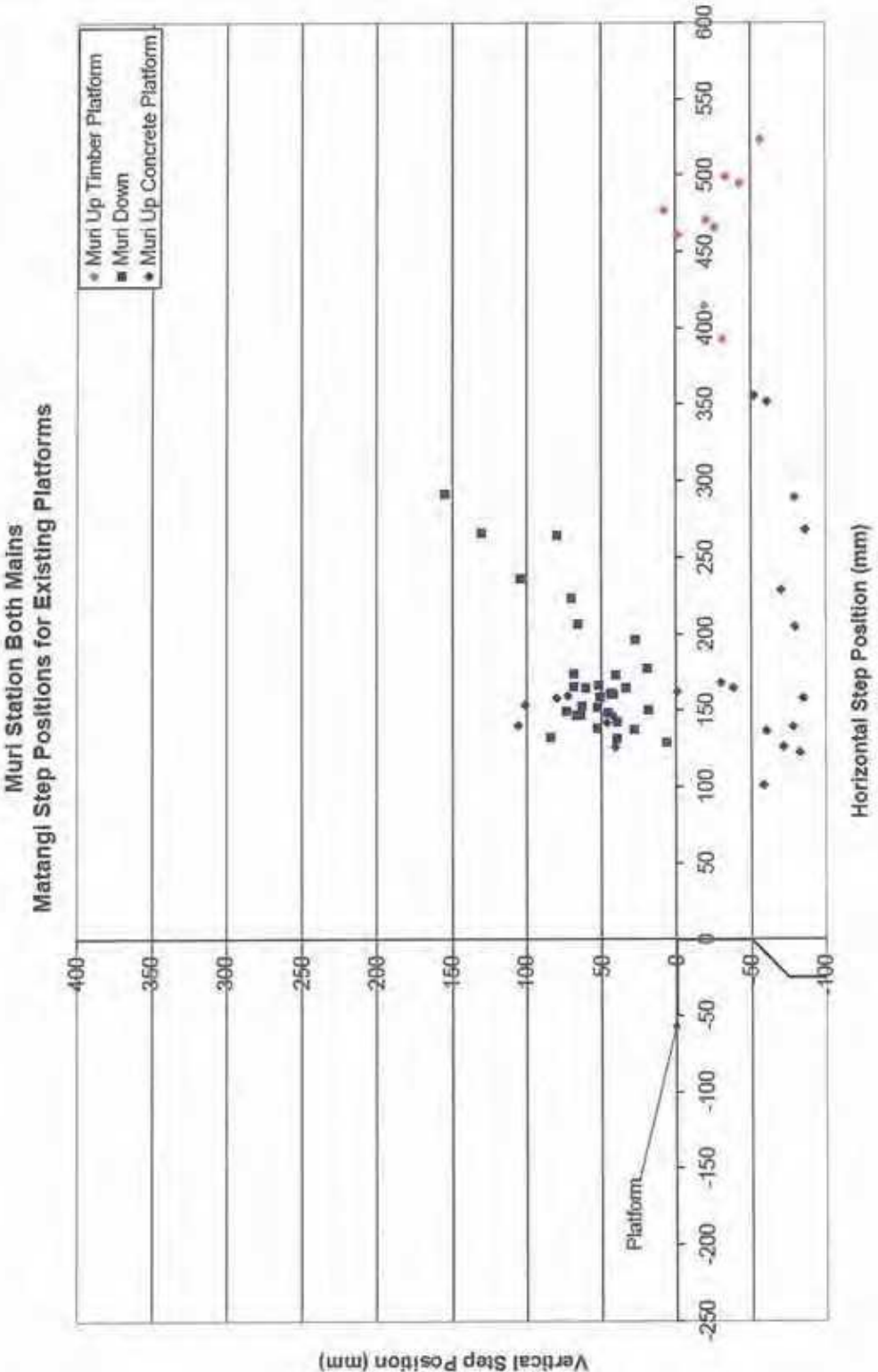
Photo 2: Looking northwest with the Up Main on the right with the timber deck section in the distance

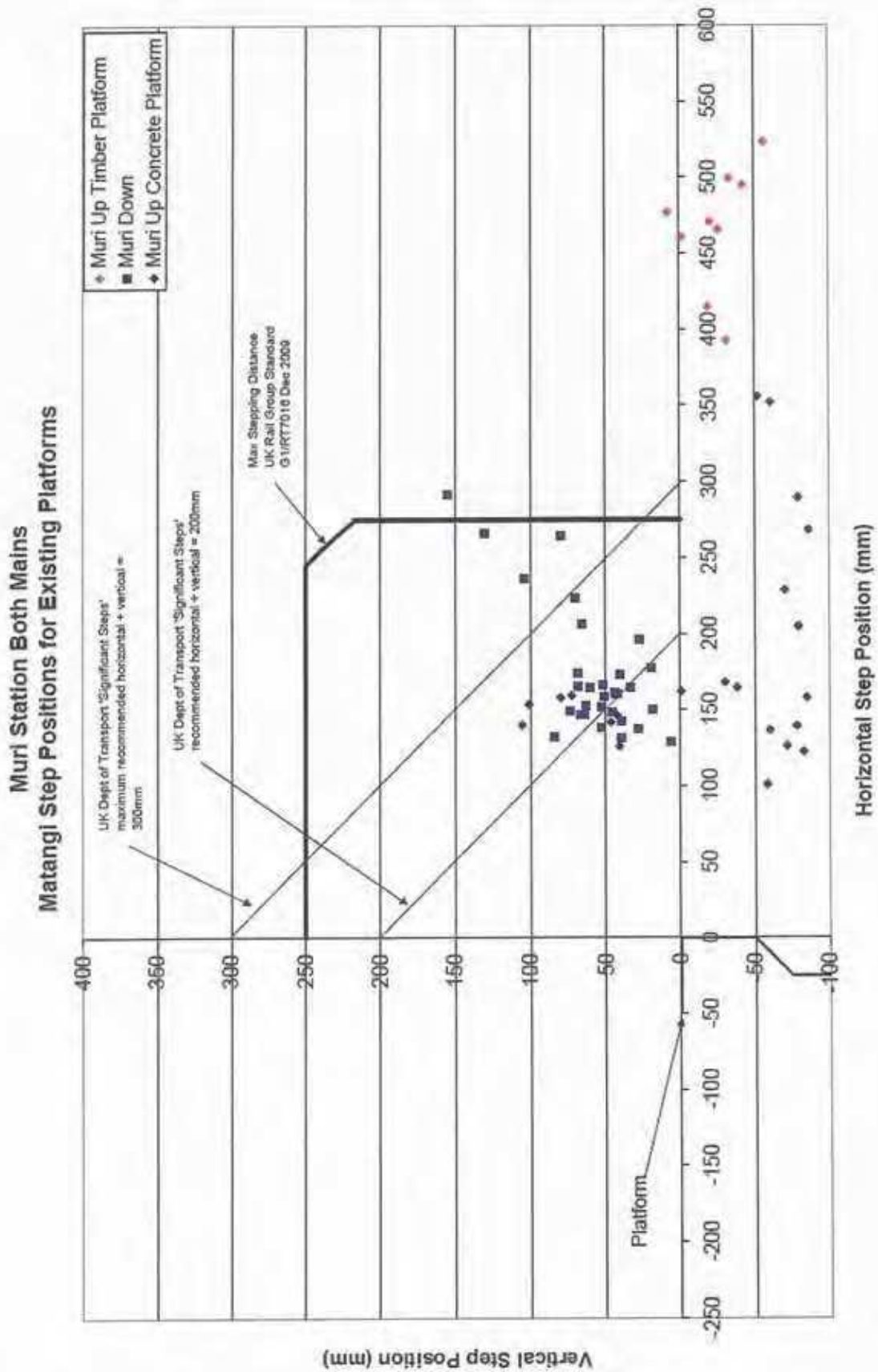
Appendix B

Muri Step Distance Graphs

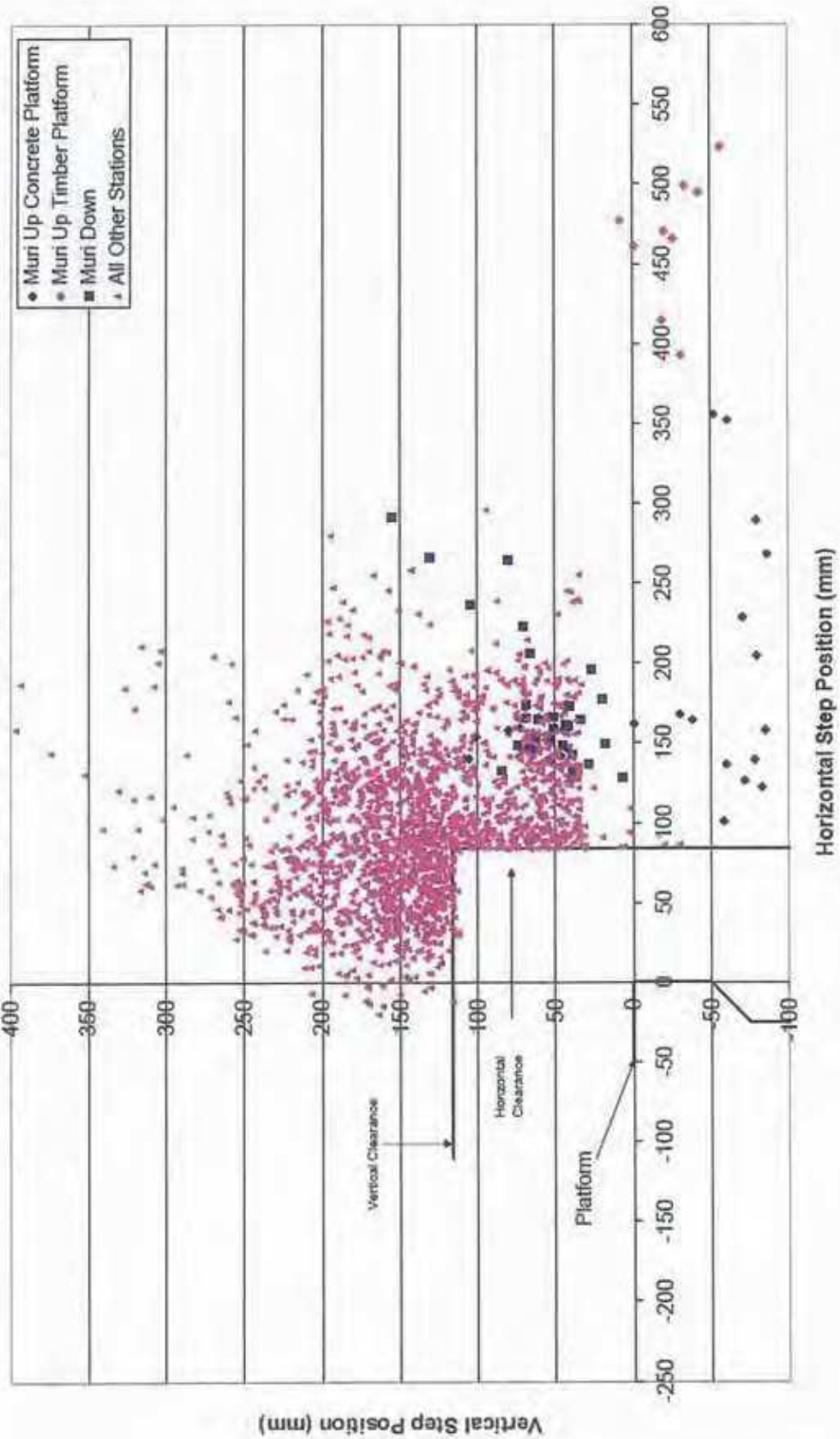


Appendix B

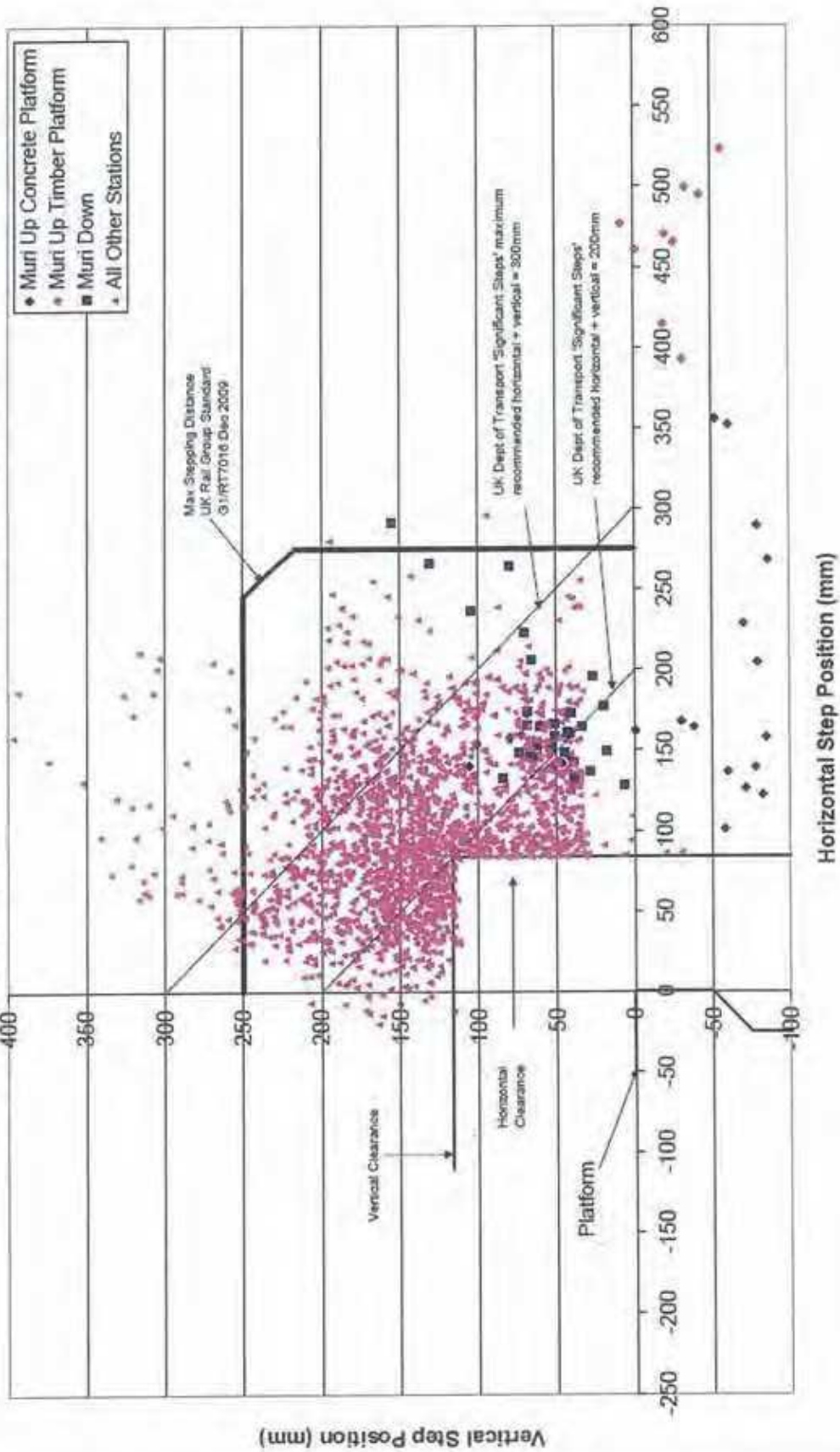




Matangi Step Positions (Step at 1310mm from track centerline)
 Post Track Realignment - Muri vs WL/NIMT and Wellington Stations



Matangi Step Positions (Step at 1310mm from track centerline)
 Post Track Realignment - Muri vs WL/NIMT and Wellington Stations



Appendix C
Part UK Railway Group Standard
GI/RT7016

Appendix C

Railway Group Standard
GI/RT7016
Issue 3
Date December 2009

Interface between Station Platforms, Track and Trains

Part 3 Standard platform position relative to adjacent track

3.1 Platform height

- 3.1.1 For new platforms and alterations (as defined) to existing platforms, the height at the edge of the platform shall be 915 mm (within a tolerance of +0, -25 mm) measured at right angles to the plane of the rails of the track adjacent to the platform.
- 3.1.2 Where a new platform or an alteration to an existing platform abuts an existing platform, any discrepancy in height and alignment of the platform shall be gradually tapered into the existing platform. The transition gradient shall not exceed 1 in 20.

3.2 Platform offset

- 3.2.1 For new platforms and alterations (as defined) to existing platforms, the platform edge shall be the minimum distance from the adjacent track (within a tolerance of +15, -0 mm) consistent with the lower sector structure gauge set out in Appendix 1 of GC/RT5212.
- 3.2.2 For most rolling stock, this requirement is met on curves with radii greater than or equal to 360 m by a platform offset of 730 mm (within a tolerance of +15, -0 mm). GC/RT5212 sets out exceptions where Class 373 trains or 2.6 m wide containers are required to pass the platform. GC/RT5212 also sets out requirements where the curve radius is less than 360 m.

3.3 Footsteps of new trains relative to standard platform position

- 3.3.1 GM/RT2149 sets out the requirements for footsteps for passenger use on new trains relative to a platform positioned in accordance with sections 3.1 and 3.2. Appendix A of GM/RT2149 requires that the footstep be designed so that the stepping distance between the footstep and the edge of the standard platform does not exceed the following maximum static dimensions for platforms on curves with radii down to 160 m:
- Horizontal 275 mm
 - Vertical 250 mm
 - Diagonal 350 mm

3.4 Increased stepping distances associated with achieving the standard platform position

- 3.4.1 Not all existing trains meet the current requirements of GM/RT2149.
- 3.4.2 Setting the position of a platform edge to meet the requirements of sections 3.1 and 3.2 of this document could therefore result in the stepping distances quoted in section 3.3 being exceeded in the case of some trains that do not meet the current requirements of GM/RT2149.
- 3.4.3 Where this is the case, adequate measures to protect the safety of passengers when boarding or alighting from trains shall be put in place before the platform is brought into use.

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Interface between Station Platforms, Track and Trains

Railway Group Standard
GIRT7016
Issue 3
Date December 2009

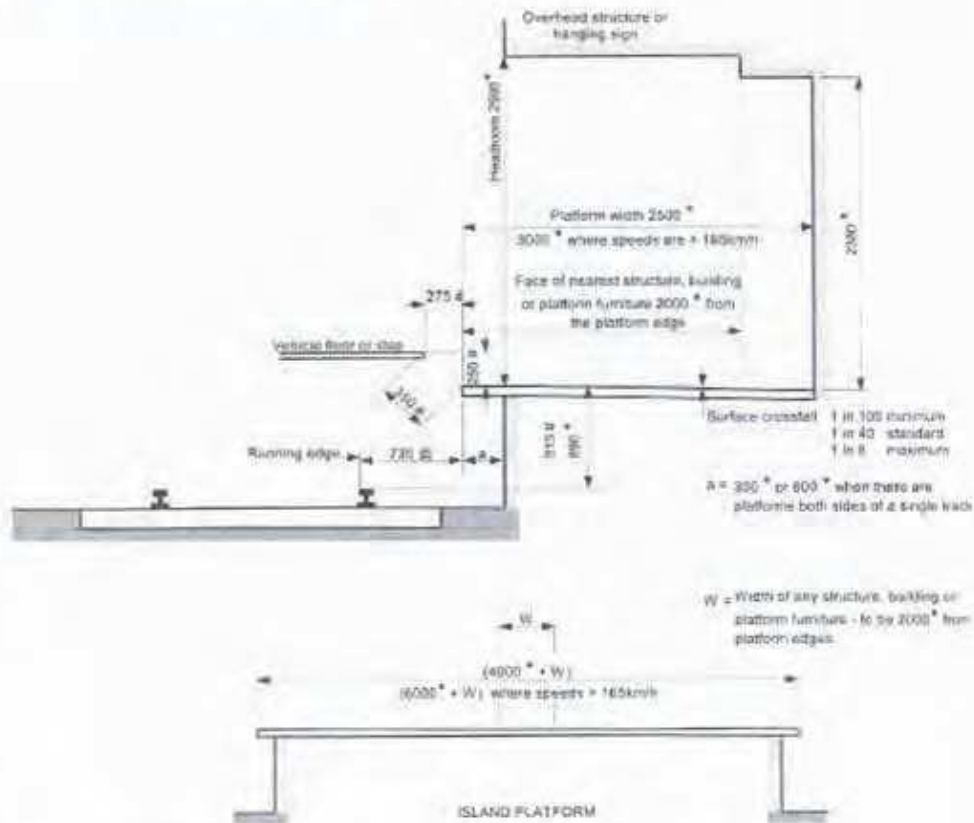
3.4.4 The measures considered shall include the following:

- a) Provision of warning signs and platform markings
- b) Provision of announcements
- c) Staff attendance

3.5 S&C adjacent to a platform

3.5.1 Where switches and crossings (S&C) are located adjacent to the platform, the effects of vehicle end throw shall be taken into account.

A.8.13: Platform Structure Standards



NOTES

1. # Indicates a **minimum** dimension.
2. + Indicates a **maximum** dimension.
3. All dimensions are in millimetres.
4. For clearances to/from the kinematic envelope, see sheet A.8.1
5. The back edges of platforms, i.e. non-track faces, are to be fenced to a minimum height of 1500 mm.
6. Longitudinal gradient through platforms to be not steeper than 1 in 500.
7. Ramps at each end of a platform are to be 2000 wide+ and not steeper than 1 in 8.
8. All dimensions shown are for straight and level track; allowances must be made for the effects of vertical and horizontal curvature, including cant.
9. @ Platform clearances are subject to the maintenance of HMRl stepping distances and specific requirements shall be calculated from the particular kinematic envelope with an allowance made for structural clearance.

Appendix D

Muri Station Train Position Drawings

