

## Appendix A – Design Parameters

(NZTA 440 PN Rail Design Parameters (1st Draft))

<b>TRACK AND CIVIL DESIGN PARAMETERS SUMMARY</b>				
<b>Parameter</b>	<b>Desirable (to be adopted where practical)</b>	<b>Absolute (to be adopted where required by site constraints)</b>	<b>Source</b>	<b>Comment</b>
Corridor width	30 m	20 m	Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 1 November 2010, Item 1	As agreed with Kiwi Rail the expressway could infringe on the rail corridor.
Design Speed	110 km/h	Aim for 110 km/h where practical otherwise as high as practical		80 km/h curve north of Otaki River Rail Bridge.
Cant (maximum)	70 mm	70 mm	ONTRACK T200 CSP/33	0 cant on tangent track. Minimise applied cant to achieve desired speed.
Cant (maximum) at stations	0 mm	50 mm	ONTRACK T200 Item 329(2)	Stations to be on straights with zero cant if practical.
Cant ramp rate (maximum)	1:1000	1:500	ONTRACK CSP/33	
Cant deficiency	60 mm	60 mm	ONTRACK CSP/33	
Excess Cant				
V≤25kph	0 mm	0 mm		
V>25kph	0 mm	0 mm		
<b>Horizontal geometry</b>				
Minimum radius (mainline)	750 m	140 m	ONTRACK CSP/33	Largest practical radius curves should be used.
Minimum curve length	20 m	20 m	ONTRACK CSP/33	
Minimum transition length	20 m	20 m	ONTRACK CSP/33	Transition lengths vary based on applied cant and curve speed, refer to Table 1 T200.
Minimum length of straight between reverse and compound curves	=V/2	20 m	ONTRACK CSP/33	Distance is between ST and TS points of adjacent curves
Maximum permitted bend (angle change without a curve) in track	0	0		
<b>Horizontal clearances</b>				
Static rolling stock outline	T200 Fig 2	T200 Fig 2	ONTRACK T200 Fig 2 and CSP/37	
Structure clearance outline	3.00 m	Considered on a case by case basis	Email KiwiRail (Stephen Curry) 20 September 2010 to Opus (Gareth McKay)	Plus curve and cant effects on all curves. (Varies from ONTRACK T200 Fig 2)
Structure clearance to isolated items e.g. poles, masts etc	2.75 m	2.60 m	ONTRACK T200 Fig 2	Plus curve and cant effects on all curves.
New track centres - mainlines outside station limits	4.0 m 5.5 m	3.8 m 5.5 m	ONTRACK T200 Item 344	Traction power poles on side. Traction power poles central. Plus curve and cant effects on all curves.
New track centres - mainlines inside station limits	4.0 m 6.0 m	4.0 m 6.0 m	ONTRACK T200 Item 344	Traction power poles on side. Traction power poles central. Plus curve and cant effects on all curves.
Mainline to siding	4.0 m 5.5 m	4.0 m 5.5 m	ONTRACK T200 Item 344	Traction power poles on side. Traction power poles central. Plus curve and cant effects on all curves.
Mainline to platform coping	1.45 m	1.45 m	ONTRACK T200 Fig 2	Plus curve and cant effects on all curves.
Existing tracks	See comment			To be maintained where no work performed. To above standards if work required.
<b>Vertical geometry</b>				
Minimum radius	=V <sup>2</sup> /1.271 m	6000 m	ONTRACK CSP/33	Largest radius curves practical to be adopted.
Vertical acceleration (maximum)	.01g	.01g	ONTRACK CSP/33	
Minimum length	40 m	15 m	ONTRACK CSP/33 Ref 8.2	
Maximum grade change not requiring vertical curve	0.00%	Governed by vertical acceleration	ONTRACK CSP/33	
Maximum grade (compensated)	Ruling grade for section	Ruling grade for section		Will generally match existing grade, reduce if possible. Grade should never be greater than 1:32 even for temporary works.
Maximum grade in yards and sidings	1 in 200 (0.5%)	1 in 200 (0.5%)	ONTRACK T200 Item 323	Ideally will fall away from the mainline
Grade compensation	n=1.65R		Westrail 3.5.5.	Where n = 1 in "n", R is curve radius in m.
Top of rail to platform coping	0.68 m	0.68 m	ONTRACK T200 Fig 2	
Overbridge clearances	5.5 m	Clearance less than 5.5 m requires the approval of the Manager, Traction Engineering	ONTRACK T200 Fig 2	
<b>Drainage</b>				
Design life	50 years		ONTRACK DRAFT Drainage Design Guidelines January 2008	
Lateral Drainage	3% cross fall		ONTRACK DRAFT Drainage Design Guidelines January 2008	Cross stormwater only required to percolate through ballast of one set of tracks.

**TRACK AND CIVIL DESIGN PARAMETERS SUMMARY**

Parameter	Desirable	Absolute	Source	Comment
<b>Stormwater outside of Rail Corridor</b>				
Primary Systems	20% AEP or 1 in 5 year return with no surcharging		ONTRACK DRAFT Drainage Design Guidelines January 2008	Unless KCDC require higher levels of service.
Secondary Systems	1% AEP or 1:100 year return		ONTRACK DRAFT Drainage Design Guidelines January 2008	If flow is piped, KCDC approval is required **
Building	No inundation for 1% AEP		ONTRACK DRAFT Drainage Design Guidelines January 2008	
<b>Stormwater inside of Rail Corridor</b>				
Primary Systems	10% AEP or 1:10 year return with no surcharging		ONTRACK DRAFT Drainage Design Guidelines January 2008	Unless KCDC require higher levels of service.
Secondary Systems	1% AEP or 1:100 year return		ONTRACK DRAFT Drainage Design Guidelines January 2008	Piped flow only if no viable alternative.**
Longitudinal (outside underground)	1% AEP or 1:100 year return with minimum 300mm freeboard from rail track Match existing if already present.		ONTRACK DRAFT Drainage Design Guidelines January 2008	To be swale drains with catchpits or turnouts as appropriate. Swales to have side slopes < 1.5h:1.0v and may be flatter where insitu soil dictates**
Longitudinal (underground)	1% AEP or 1:100 year return with minimum 600mm freeboard from rail track - Match existing if already present.		ONTRACK DRAFT Drainage Design Guidelines January 2008	Unless KCDC requirements are more onerous.**
Manholes	60m centres		ONTRACK DRAFT Drainage Design Guidelines January 2008	At all changes in grade, horizontal alignment or max crs 60m
Cross Stormwater	10% AEP or 1:10 year return with no surcharging and 1% AEP with min 600mm freeboard to rail tracks		ONTRACK DRAFT Drainage Design Guidelines January 2008	Match existing waterways if in close proximity
Open drains				
Longitudinal gradient (minimum)	1 in 300 (0.33%)	1 in 500 (0.20%)		
Invert width (minimum)	500 mm	300 mm		
Depth below underside of capping (minimum)	300 mm	200 mm		
<b>Track and track structure</b>				
Track weight for new work	50 kg/m		As agreed	
Axle load for infrastructure	22.5 t	22.5 t	As agreed	
Axle load for structural design	25 t	25 t	As agreed	Existing bridges to be retained as-is.
Ballast depth under sleeper (minimum)	300 mm	300 mm	ONTRACK T200 Fig 4	150 mm at sidings.
Ballast shoulder	350 mm	300 mm	ONTRACK T200 Fig 4	*400 mm on curves < 600 m R. *Refer to 4.1.5 Ballast shoulder for discussion on this addition to ONTRACK standard
Track structure (new work)	Concrete sleepers on ballasted track			Except for turnouts, bridges and level crossings.
Turnouts	1 in 18	1 in 12	ONTRACK CSP/63	Mainlines only. Sidings on a case by case basis.
Half formation width (CL to formation edge) straight track and curves ≥ 8000 m radius	3.00 m	Considered on a case by case basis.	ONTRACK T200 Fig 1	Width to edge of sub-ballast. Drain required in cuts.
Formation cross slope	1 in 33	1 in 20	ONTRACK T200 Fig1 # As agreed in discussions with ONTRACK.	New track to fall away from existing. *Refer '4.1.5 Formation width for discussion on variance from ONTRACK standard
Sub-ballast (capping)	50 mm	50 mm	ONTRACK T200 Fig 4	
Formation fill batter slope	2H : 1V	1H : 1.5V		As recommended by the geotechnical engineer and agreed with KiwiRail
Cut batter slope				As recommended by the geotechnical engineer and agreed with KiwiRail
Formation- sub-grade strength	15-20% CBR		ONTRACK - As agreed	
Rail seat	1 in 20 inward tilt	1 in 20 inward tilt	ONTRACK material specification	Vertical for turnouts.
Sleeper spacing	700 mm typical; 600 mm on curves less than 400 m radius	700 mm typical; 600 mm on curves less than 400 m radius	ONTRACK T200 Fig 5	Otherwise in accordance with Fig 5 of ONTRACK T200.
Track gauge	1068 mm (narrow gauge)	1068 mm (narrow gauge)	ONTRACK T200 Item 302	Note 1074 gauge for curve radius <250m. Check rail to be considered in these cases.
<b>Crossing Loop</b>				
Length	1104 m			Ontrack Sketch "Waikanae Stabling and Crossing Loop" (17 November 2009)
Clearance - Mainline to crossing track	4.00 m			
Turnout	1 in 12			
Radius - turnout to crossing track	565 m		CCE 97579	
<b>Settlement Criteria</b>				
Longitudinal deviation (top fault)	14 mm for a 10 m chord at any time		As agreed	
Cross deviation (twist)	10 mm for a chord of 10 m		As agreed	
Maximum differential settlement	20 mm		As agreed	

TRACK AND CIVIL DESIGN PARAMETERS SUMMARY				
Parameter	Desirable	Absolute	Source	Comment
<b>SPECIFIC SITE PARAMETERS (These parameters replace or are in addition to those in the summary above)</b>				
<b>Mary Crest</b>				
<b>Te Horo</b>				
Future Station			Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 2 September 2010, Item 3	Discussion KiwiRail/NZTA/GWRC/OPUS
<b>South Otaki</b>				
<b>Horizontal geometry</b>				
Minimum radius (mainline)	500 m	475 m	Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 2 September 2010, Item 4	Provides for 80km/h curve
<b>Otaki Railway Station</b>				
<b>Horizontal geometry</b>				
Minimum radius (mainline)	901 m		Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 1 November 2010, Item 3	
<b>Platform width</b>				
Future Station			Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 2 September 2010, Item 3	KiwiRail to advise Subject to KiwiRail confirmation
				Locate south of the railway station subject to KiwiRail confirmation
<b>Stabling</b>				
Length	200 m	150 m	Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 1 November 2010, Item 3	Locate south of the railway station subject to KiwiRail confirmation
Turnout	1 in 9	1 in 9	ONTRACK CCE97579	Waikanae stabling and crossover
<b>Horizontal clearances</b>				
Mainline to siding	5.6 m		Ontrack Sketch "Waikanae Stabling and Crossing Loop" (17 November 2009)	
<b>Ballast Pit</b>				
				Locate south of the railway station subject to KiwiRail confirmation
<b>North Otaki</b>				
Realign rail from south of Otaki Station to south of the Waitohu Bridge.			Peka Peka to North Otaki Meeting Notes. NZTA 440/442PN KiwiRail Technical Meeting 2 September 2010, Item 2	Expressway may sever KiwiRail maintenance access. Discuss options with KiwiRail.
* indicates variance from ONTRACK standard				
** Where necessary to pipe drainage, pipes to have min dia. 300mm and laid to min grade 1%. Where pipes cross track shall be min Z* class reinforced rubber ring jointed with min				
"CoP" Is the Code of Practice for the Defined Interstate Rail Network (Australia)				
"Westrail" is the Westrail Narrow Gauge Code of Practice (Western Australia)				
"ONTRACK T200" is the ONTRACK T200 Infrastructure Engineering Handbook				

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