

APPENDIX 10 – SPECIALIST WORKING PAPER – NATURAL
HAZARDS (FLOODS AND TSUNAMIS)

Peka Peka to Otaki – Assessment of Alternative Routes

Specialist Working Paper – Natural Hazards (Floods and Tsunamis)

Introduction

This working paper summarises the results of a desktop assessment of flood and tsunami hazard impacts on a range of alternative route options for the proposed Pekapeka to North Otaki Expressway. This includes the Board Preferred Option which terminates just south of Taylors Road at its northern end. However, for the purposes of this assessment, the northern end of these alternative routes is along the existing alignment of State Highway 1 (SH1) just south of Manakau.

The alternative routes cross a number of watercourses and surface ponding areas between Manakau in the north and Pekapeka in the south. These are listed in Table 1.

Information Sources

The assessment of the impact of flood hazards on the alternative route options relied principally on a composite flood hazard map prepared jointly by the Greater Wellington Regional Council and the Kapiti Coast District Council. This map shows flood hazard areas for natural watercourses for a 1% annual exceedance probability (AEP) flood as well as flood hazard areas for a 1% AEP rainstorm impacting urban drainage systems. It should be noted the 1% AEP flood for different watercourses is likely to be caused by different storm durations (i.e. the flood hazard areas shown on the composite hazard map will reflect causative storm events of widely varying durations and not a common duration).

Figure 1 shows this flood hazard map superimposed on a Google Earth image of the area with the alternative route options overlaid on top.

The assessment of the impact of flood hazards on the alternative route options was complemented by reference to a number of reports commissioned by Greater Wellington Regional Council which are the original source material for the natural watercourse flood hazard zones shown on the hazard map in Figure 1. These reports are listed at the end of this specialist working paper for the following water-courses:

- Waitohu Stream (GWRC, 2003; GWRC, 2004)
- Mangapouri Stream (WRC, 1998)
- Otaki River and Floodplain (GWRC, 2007)
- Mangaone Stream (MWH, 2002a; MWH, 2002b)

The flood hazard for the Waiautu Stream is unknown as this watercourse lies outside the Wellington Region and Kapiti Coast District (it lies within the Manawatu-Wanganui Region and Horowhenua District).

The assessment of the tsunami hazard on the alternative route options relied on a tsunami evacuation map prepared for the Otaki area by the Kapiti Coast District Council.

Results of Desktop Assessment

Table 1 below summarises the assessed flood hazard impact for each alternative route alignment. In addition to the major watercourses identified previously, a number of other minor watercourses are considered in this qualitative assessment.

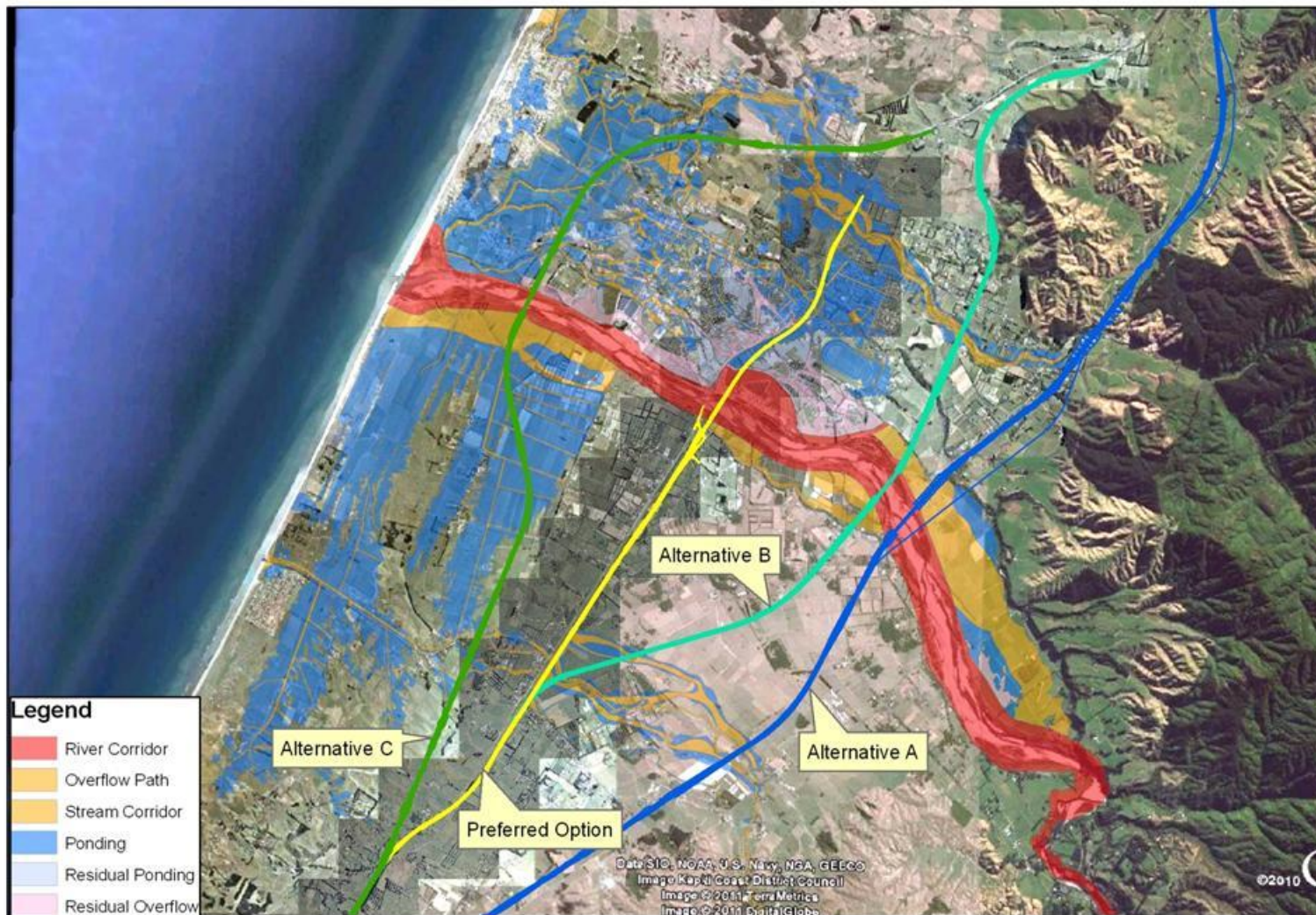


Figure 1 Alternative route options overlaid on flood hazard areas for natural water courses and urban drainage systems

Table 1 Summary of assessed flood hazard impacts for each alternative route alignment

Watercourse	Route Option			
	A – Eastern Foothills	B – Eastern Central	C – Western (Te Waka)	Board Preferred Route
Waiauti Stream	Unknown	Unknown	Unknown	Unknown
Waitohu Stream	Minor flood hazard – stream breaking out of foothills onto coastal plain	Minor flood hazard from localised flood breakout from main channel	Route crosses extensive flood storage area in Convent Rd area Flood depths up to 2+m	Route crosses extensive overland flow path for breakout flows from main channel upstream of existing SH1 bridge and from Greenwood Catchment
Mangapouri Stream	Not affected – outside catchment	Not affected – outside catchment	Route crosses extensive flood storage area upstream of Mangapouri Stream confluence with Waitohu Stream	Expressway embankment and culvert required to function as flood detention bund in order to throttle downstream flood flows (replaces railway embankment and culvert)
Unnamed stream parallel to Ringawhiti Road	Unknown	Not affected	Not affected	Not affected
Otaki River floodplain	Route crosses secondary flow path ~400m wide along right bank of river	Route crosses ~200m wide secondary flow path along right bank and ~300m wide secondary flow path along left bank	Route crosses extensive flood storage area formed by unnamed local stream draining part of area between Otaki Township and Otaki Beach Village	Route crosses residual overland flow path for floods >1% AEP design flood overtopping stopbank
Otaki River	Skewed alignment where river already wide	Bridge on skewed alignment at start of slight bend Right abutment subject to heavy bank attack	Route crosses extensive ~300m wide secondary flow path along left bank of river for flood flows	North approach embankment acts as partial dam and elevates floodwaters in off-river basin occupied by concrete factory leading to stopbank overtopping
Lethbridge Rd / Te Waka Rd / Swamp Rd area	Not affected	Not affected	Route crosses extensive surface ponding area	Not affected
Mangaone Stream	Route crosses breakout flow paths from main channel across alluvial fan surface	Route crosses breakout flow paths from main channel across alluvial fan surface	Route crosses isolated breakout paths across alluvial fan surface	Route crosses several breakout paths across alluvial fan surface – expressway embankment acts as flood detention bund

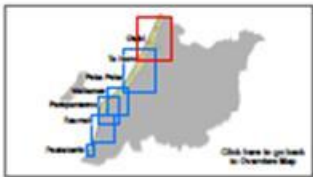
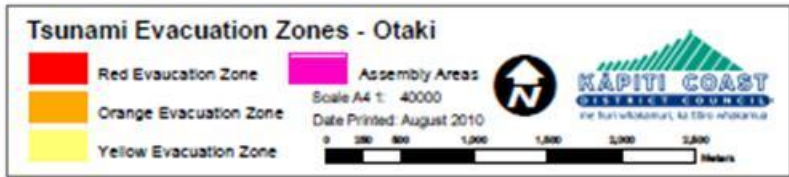
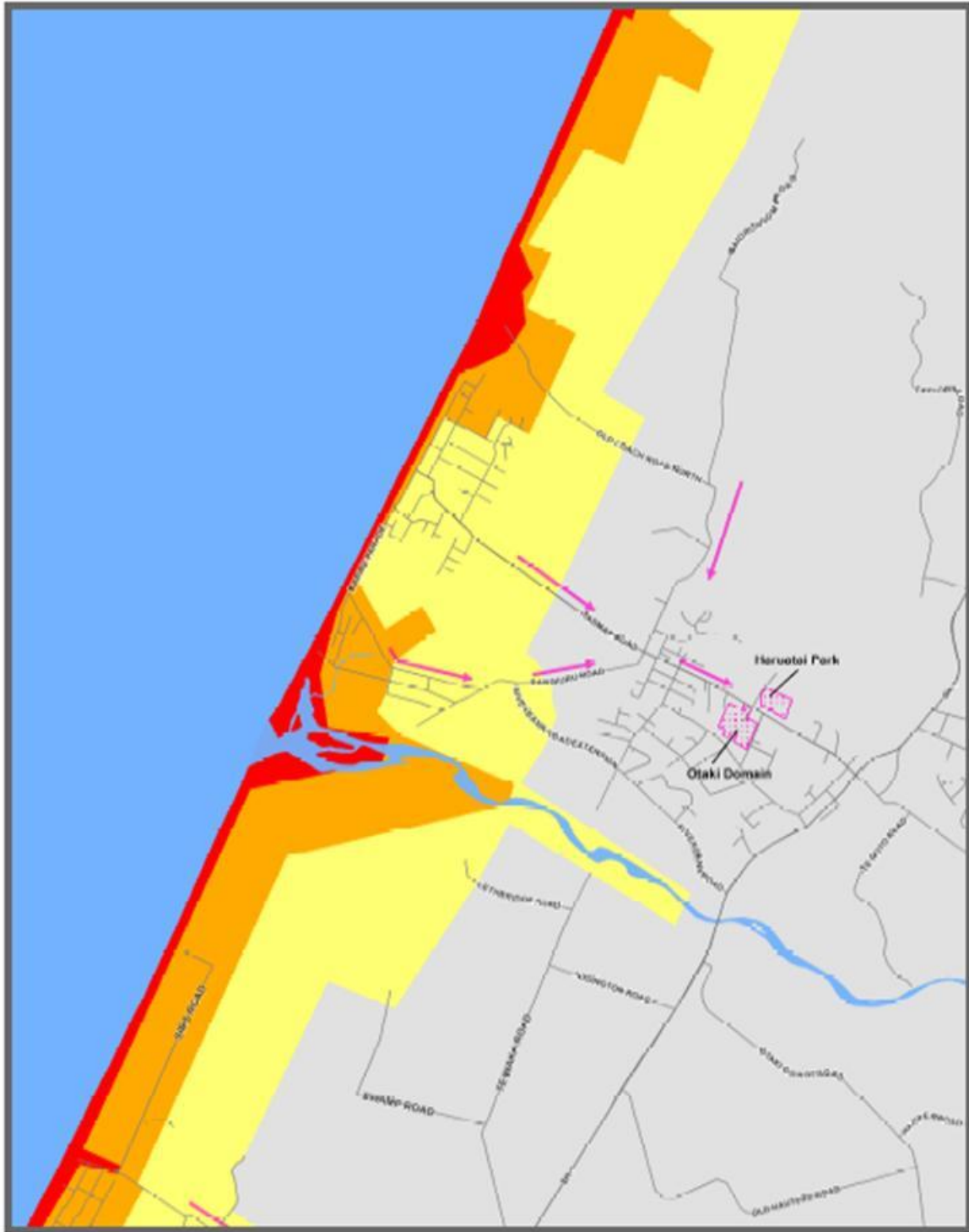


Figure 2 Tsunami evacuation zone map for Otaki area prepared by Kapiti Coast District Council

Figure 2 shows the tsunami evacuation zone map for the Otaki area prepared by the Kapiti Coast District Council. The Western (Te Waka) Alternative Route C is the only route that is affected by the tsunami hazard. Part of this route lies in the yellow zone (the zone requiring evaluation for the largest possible tsunami) while the bridge crossing of the Otaki River and its south bank approach falls into the orange zone (the zone likely to be evacuated during official warnings and evacuations). The bridge structure itself could well be elevated sufficiently to be clear of the tsunami runup level although this is by no means certain. The south bank approach would block the tsunami runup path.

Overall Evaluation

I have assessed the impact of flood and tsunami hazards on the alternative routes as follows:

<i>Route</i>	<i>Evaluation</i>
Alternative A – Eastern Foothills	0
Alternative B – Eastern Central	0
Alternative C – Western (Te Waka)	--
Board Preferred Route - Central	-

In most cases, the flood hazard impacts on each route alternative would generally be able to be mitigated. However, while mitigation of the flood hazard for the Western (Te Waka) Route C through the flood storage area between Otaki Township and Otaki Beach Village could be achieved by construction of an elevated embankment with strategically located culverts, the extensive nature of the storage zone in this area may very well make the existing flood hazard worse for other property owners in the vicinity.

Generally the flood hazard impact is lowest for the more eastern route alignments and greatest for the western alignment.

The tsunami hazard only affects the Western (Te Waka) Alternative Route C.

References

GWRC (2003). Waitohu Stream Study: Flood Report. Report prepared by M Harkness, Resource Investigations Department, Greater Wellington Regional Council, July 2003.

GWRC (2004). Waitohu Stream Study: Hydraulic Modelling. Report prepared by P Wallace, Flood Protection, Greater Wellington Regional Council, July 2004.

GWRC (2007). Hydraulic Assessment of Chystall's Extended Stopbank. Report prepared by P Wallace for Greater Wellington Regional Council, March 2007.

MWH (2002a). Mangaone Stream Flood Hazard Assessment, Summary Report. Report prepared by Montgomery Watson Harza for Wellington Regional Council, WRC Publication No. WRC/FPSA-T-02/25, June 2002.

MWH (2002b). Mangaone Stream Flood Hazard Assessment, Hydraulic Modelling Report. Report prepared by Montgomery Watson Harza for Wellington Regional Council, 2 volumes, WRC Publication No. WRC/FPSA-T-02/27, June 2002.

WRC (1998). "Otaki Floodplain Management Plan, Mangapouri Stream Upgrade, Hydraulic Modelling Report", Wellington Regional Council Report No. WRC/RI-T-97/48, February 1998.

Dr Grant Webby

Principal Hydraulic Engineer / Technical Principal (Hydraulic and River Engineering)
Water Resources Group, Opus International Consultants Ltd, Wellington

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