FLOOD RISK AT WHAKATANE

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The Whakatane River, 60 miles long and draining a catchment of 675 sq. miles on the northern flanks of the Huiarau Range, enters the sea at Whakatane. For 15 miles up-stream, it flows in a shallow meander trough cut after the Kaharoa eruption of around 900 years ago (Fig.1). Near Whakatane, channel migration has been active for hundreds of years and accumulation since the Tarawera eruption of 1886 has been quite appreciable. And while these are normal geological processes, their combined effects unless modified can have a marked bearing on the safety of an expanding town such as Whakatane. Channel migration causes the loss of valuable urban land by riverbank corrasion, and accumulation has lessened the value of the trough for storage in times of near-flood or as an asset in delaying a flood. Consequently, this reduction in storage can mean only more frequent threats of flooding to a town already low-lying — for the most part no more than 10ft above sea level. Properly designed stopbanking is now a necessity.

MEANDERS

Courses at the time of the Kaharoa eruption, at 1867, and at 1944, are shown in Fig.2. The "Kaharoa course" is plotted from a well defined abandoned channel associated with natural levees having the oldest recent soils and containing a 4 inch seam of white Kaharoa Ash within 3 ft of the surface; the 1867 course is plotted from old map records held by the Department of Lands and Survey, Auckland, and the Whakatane and District Historical Society; and the 1944 channel from the N.Z. Mosaic Map Series 3, sheet N.69/7. Thus, over a span of 900 years, meanders have been conspicuous near the town; at present being most pronounced at Poroporo and at James Street. In the former locality, banks of soft silty pumice alluvium are easily eroded and in the latter, corrasion takes the form of slumping in slices 10 to 15ft wide and a chain long. As well, in both places loose, small pumice gravel comprises much of the alluvium. Of immediate concern is the attack on the James Street "loop", now a densely populated area, where sooner or later the neck will be breached and the loop severed, unless the bank is artificially protected.

At Poroporo, meanders are actively sweeping. The rate may be gauged from the observation that in the course of laying a pipeline across the 1867 channel, Tarawera Ash was identified as a mantling bed. This means that the

channel had migrated appreciably in 20 years (1867-1886).

Early meandering, both before the Kaharoa eruption and for a while afterwards, may have been encouraged by local aggradation from alluvium deposited by the Waioho Stream (Fig.2), the floodplain of which has Kaharoa Ash 12 to 24in. from the surface. But today, most flood detritus is dropped well upstream of its confluence with the Whakatane River (Fig.3). The Wainui te Whara Stream became a tributary of the latter only after the Kaharoa eruption and much of its alluvium was laid down on its own fan (Fig.3). For more modern meanders, then, a tidal effect is assumed.

As the Whakatane River is now being examined by the Eastern Bay of Plenty Catchment Commission whose field of competency it is, no more will be said about this aspect of flood risk, except to suggest that the long term propensity to meander at Whakatane should be taken into account in river control studies.

ACCUMULATION

Tarawera Ash (1886) occurring as a 2in. seam of black sand, was used as a marker bed to measure the thickness of alluvium accumulated since the eruption. Isopleths are plotted in Fig.3. Infilling is more marked south of the town where minor flooding frequently covers the floor of the trough, and at Poroporo the sudden increase may be due to a tidal effect. At Poroporo also, where water flows out of the trough at time of high flood, the surface is gradually being raised and eventually this form of levee will have the effect of confining more water to the trough and causing it to encroach on the James Street "loop".

For this 10 mile length of river, including the estuary, a common width is 12 chains (792ft)and the area of trough about 1600 ac. Depth of trough to the Tarawera Ash is about 15ft at the southern end and about 10ft at Poroporo, reducing to 7ft at Piripai. Berm surfaces are not flat, however, but rise towards the river where a modern levee is being raised by flooding. Assuming a depth of 10ft and an accumulation of 12in., an indication of the loss of floodwater storage in the last 77 years is 10% or 1600 ac.ft.

Accumulation from both the Wainui te Whara and Waioho Streams is also plotted. The importance of the former has not been appreciated; it is sensitive to high intensity rains in its small catchment and over the years has built up quite a large fan. Continued flooding of parts of the town can still be expected until properly designed measures are executed. Much of the detritus of the Waioho Stream consists of small pumice gravel and sand spread over farmland well away from the Whakatane River. However, floodwater spills over into the Whakatane West basin, and

Fig. 1

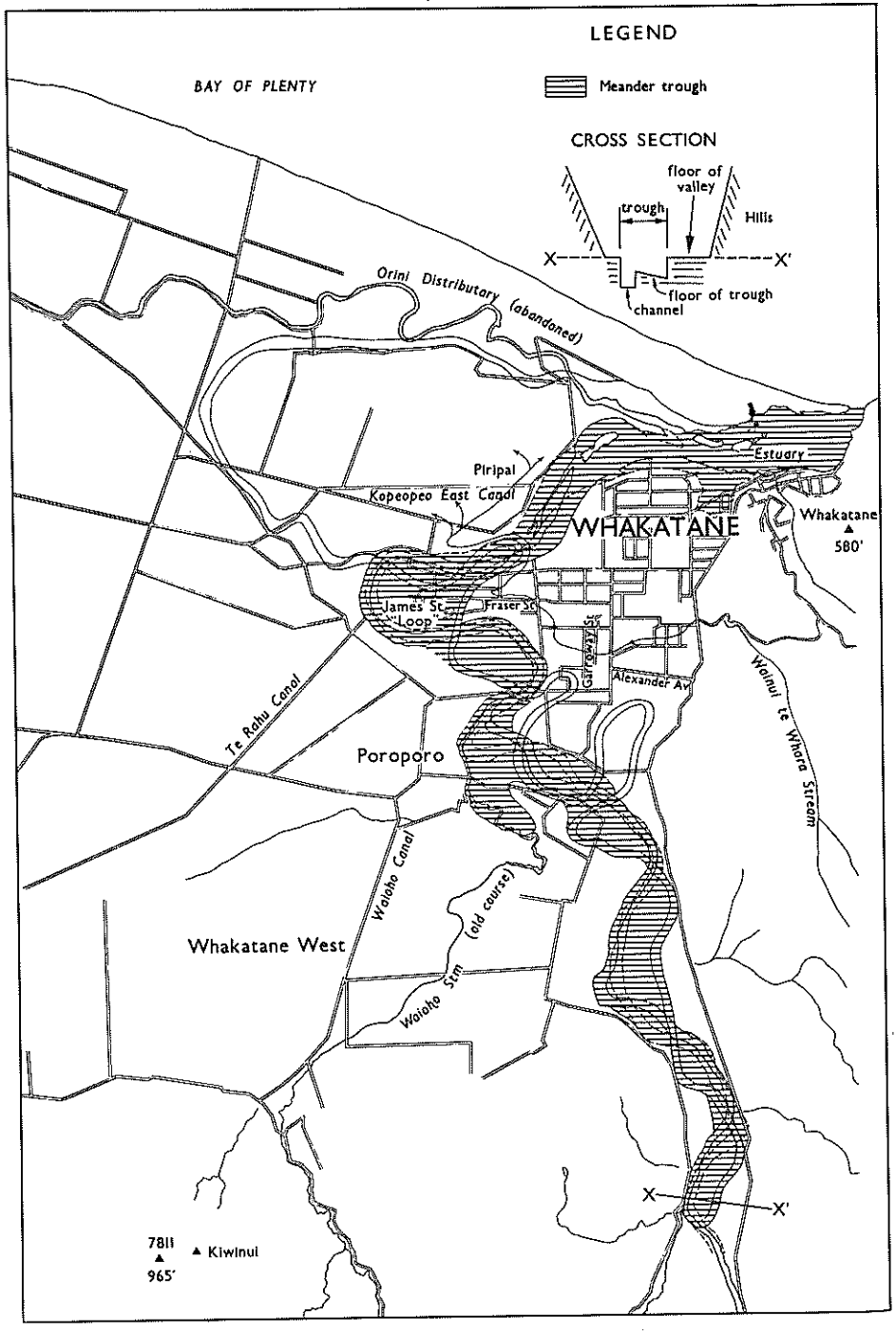

LEGEND
Meander trough
CROSS SECTION
floor of valley
trough
Hills
X
X'
floor of trough
channel
BAY OF PLENTY
Orini Distributary (abandoned)
Piripai
Kopeopeo East Canal
Estuary
WHAKATANE
Whakatane
580'
James St Loop
Fraser St
Garraway St
Alexander Av
Waimi te Whara Stream
Te Rahu Canal
Poroporo
Waioho Canal
(old course)
Whakatane West
Waioho Stm
X
X'
781
965'
Kiwinui

Fig. 2

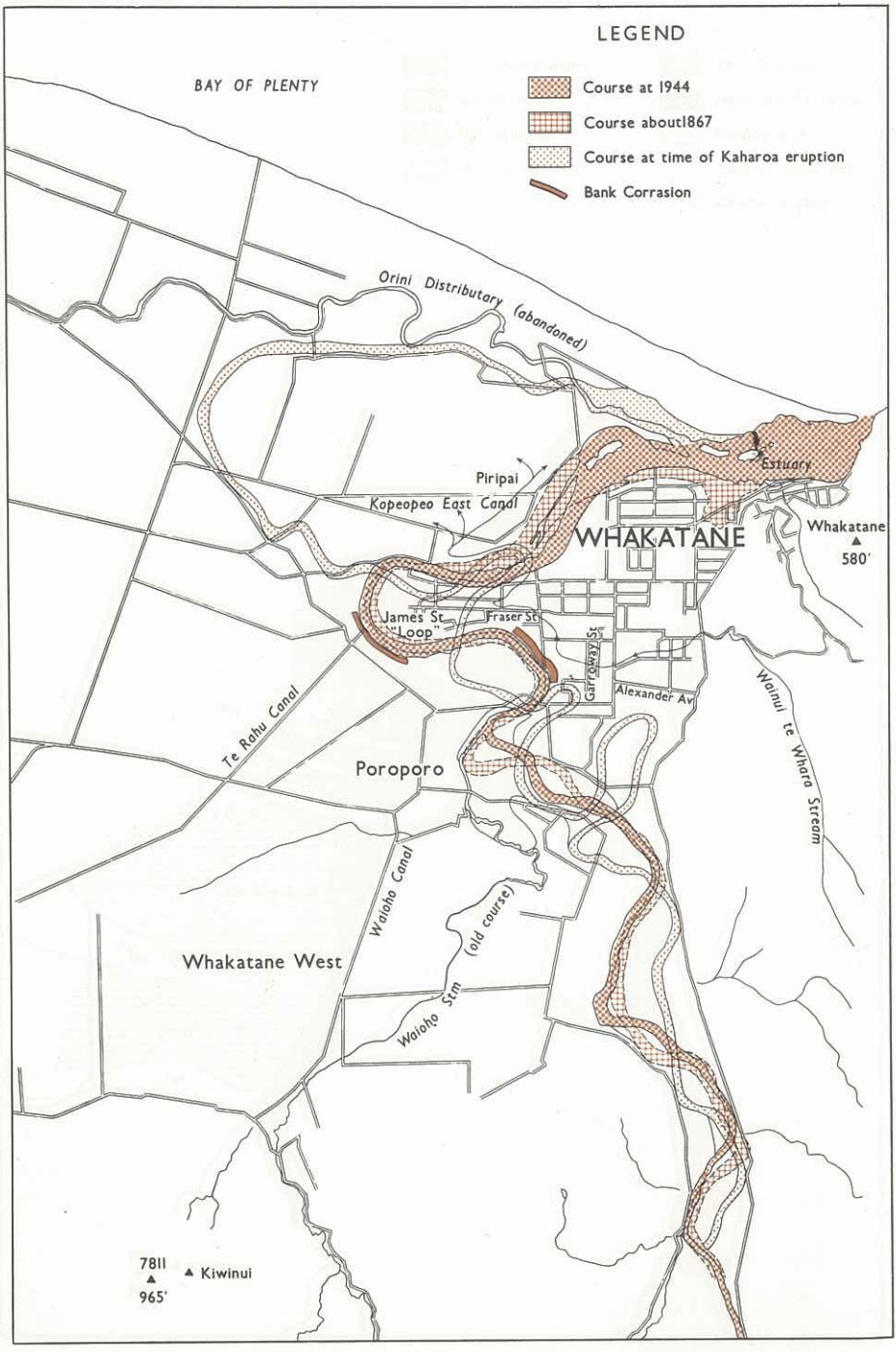
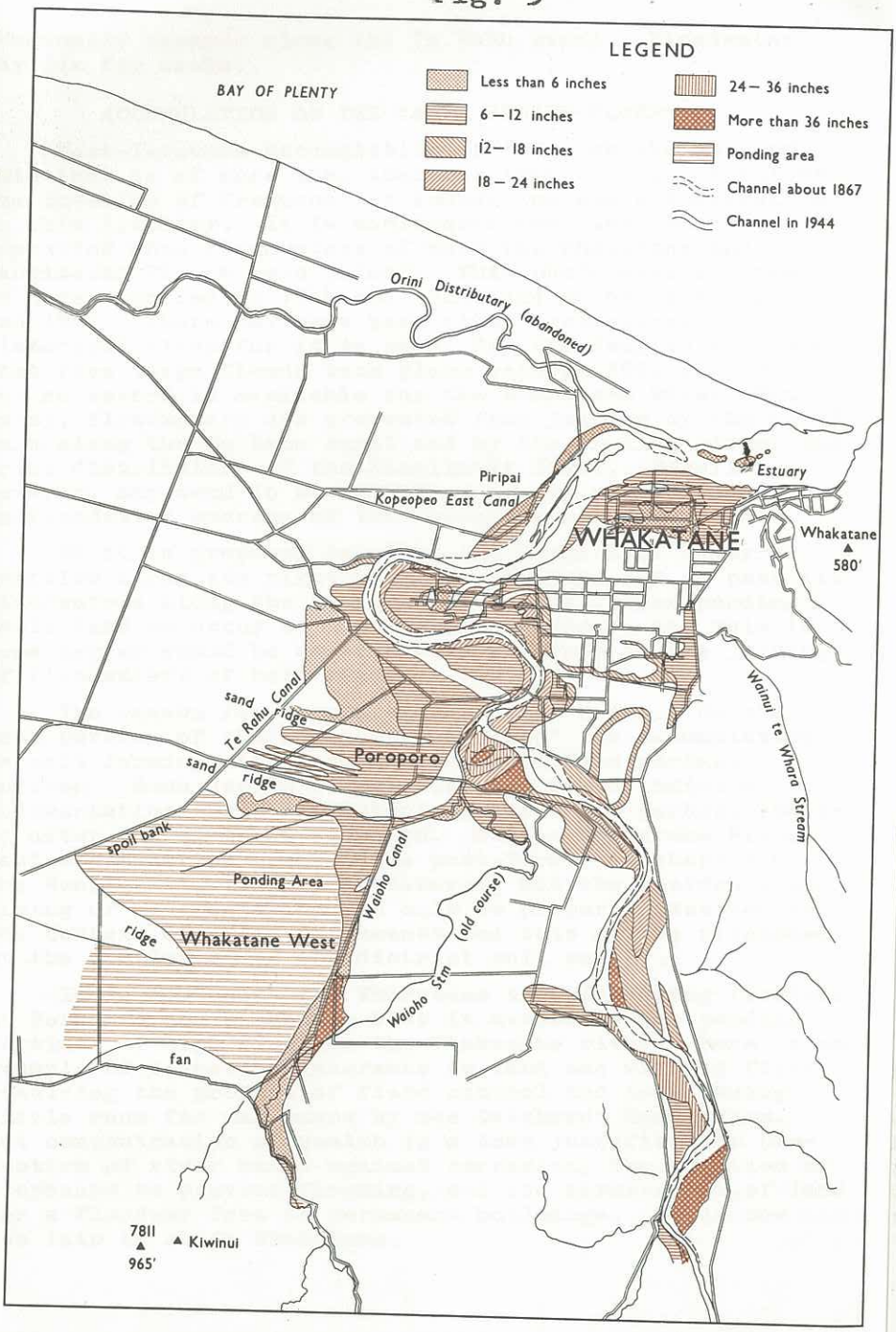

LEGEND
Course at 1944
Course about1867
Course at time of Kaharoa eruption
Bank Corrasion
BAY OF PLENTY
Orini Distributary (abandoned)
Piripai
Kopeopeo East Canal
Estuary
WHAKATANE
Whakatane
▲
580'
James St "Loop"
Fraser St
Garroway St
Alexander Av
Te Rahu Canal
Poroporo
Wainui te Whara Stream
Waioho Canal
Whakatane West
Waioho Stm (old course)
7811
▲
965'
▲ Kiwinui

Fig. 3


LEGEND
Less than 6 inches
6 – 12 inches
12 – 18 inches
18 – 24 inches
24 – 36 inches
More than 36 inches
Ponding area
Channel about 1867
Channel in 1944
BAY OF PLENTY
Orini Distributary (abandoned)
Piripai
Kopeopeo East Canal
Estuary
WHAKATANE
Whakatane
▲
580'
sand ridge
Te Rahu Canal
sand ridge
Poroporo
Waiwai te Whara Stream
spoil bank
Ponding Area
Waioho Canal
(old course)
ridge
Whakatane West
Waioho Stm
fan
7811
▲
965'
▲ Kiwinui

eventually escapes along the Te Rahu canal. Floodwater may lie for weeks.

ACCUMULATION ON THE JAMES STREET "LOOP"

Post-Tarawera accumulation of 12in. on the neck of this loop is of more than academic interest, as it raises the question of frequency of inundation and sedimentation in this locality. It is considered that sediment was deposited when floodwaters of both the Whakatane and Rangitaiki Rivers were joined. This phenomenon is known to have occurred in 1944 and 1925, and probably in 1904 and 1891. There may have been other occurrences in historical times for it is said, for the Rangitaiki River, that five large floods took place between 1891 and 1925, but no record is available for the Whakatane River. But today, floodwaters are prevented from joining by the spoil bank along the Te Rahu canal and by the sealing-off of the Orini distributory of the Rangitaiki River. Benefits, however, may tend to be nullified by the marked reduction in floodwater storage of the Whakatane meander trough.

If it is proposed to allow the Rangitaiki River to overflow along its right bank from Te Teko and to pass its floodwaters along the Kopeopeo East canal, then ponding would tend to occur at the Whakatane estuary and this in some degree would be as effective a threat as the joining of floodwaters of both rivers.

The reason for accumulation is not known. On the neck portion of the James Street "loop" the accumulation is soil forming with a fairly well humified surface horizon. Such degree of melanisation would indicate sedimentation early in historical times and perhaps shortly after the Tarawera eruption. On the Whakatane River, most accumulation seems to be post-Tarawera, whereas on the Rangitaiki, it is post-Kaharoa; but the incidence and timing of sedimentation can only be properly assessed in the context of whole catchments and this may be attempted at the completion of the district soil survey.

It is fortunate for Whakatane that low-lying farmland at Poroporo and Whakatane West is available for ponding at times of high flood on the Whakatane river. Here is an example of competing interests in land use without first resolving the problem of flood control and now leaving little room for manoeuvre by the Catchment Commission. But concentration of wealth in a town justifies the protection of river banks against corrasion, the erection of stopbanks to prevent flooding, and the reservation of land for a floodway free of permanent buildings. It is now too late to shift Whakatane.