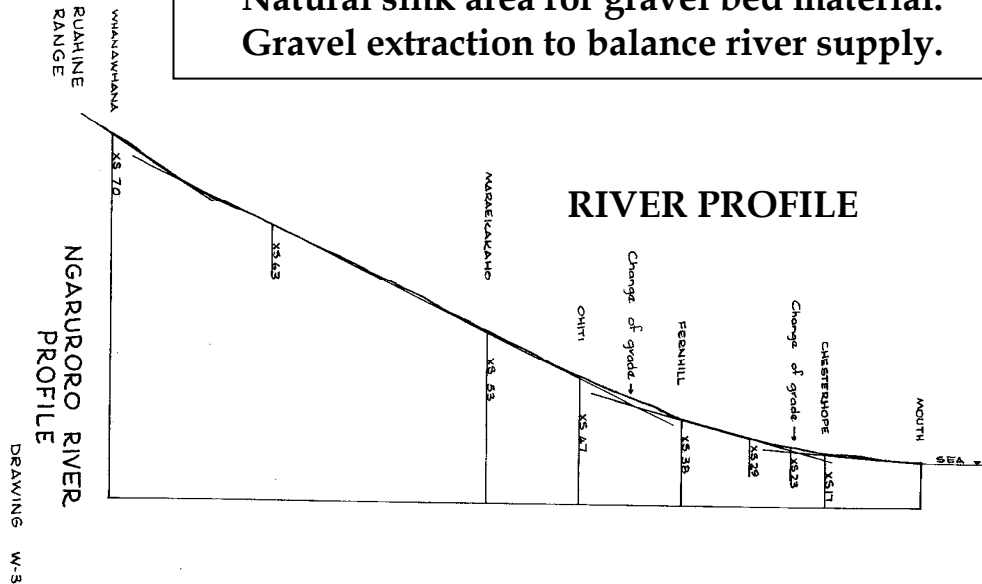
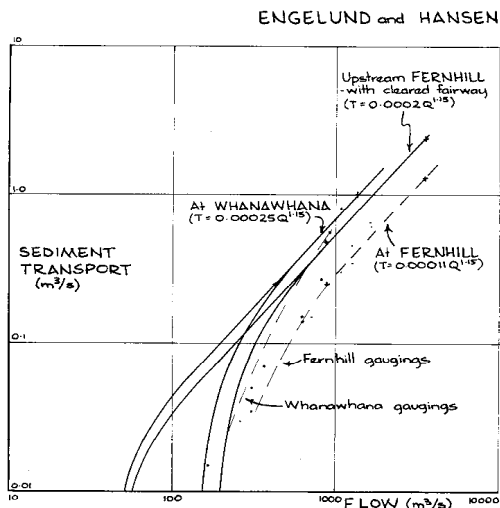


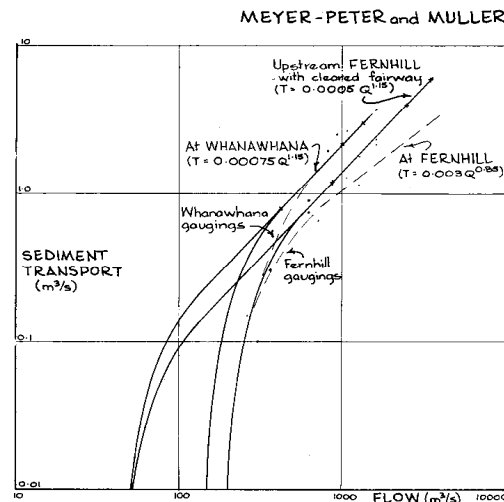
Natural sink area for gravel bed material.
Gravel extraction to balance river supply.



SEDIMENT TRANSPORT CURVES



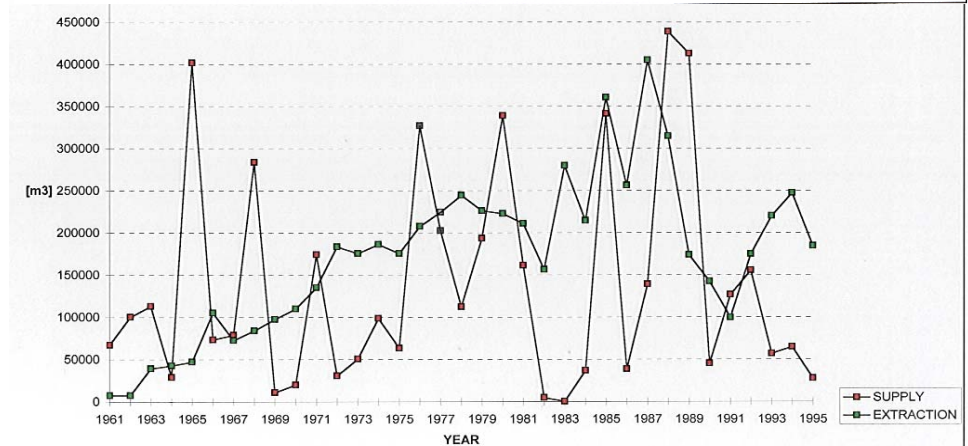
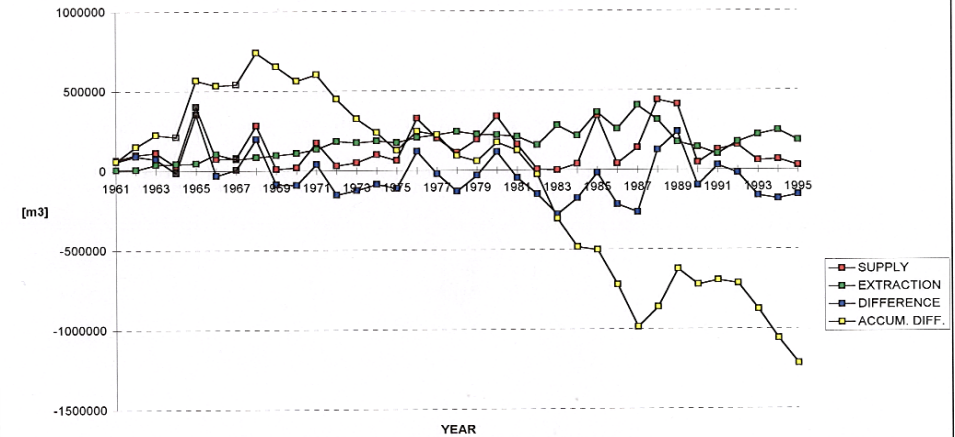
SEDIMENT RATINGS
DRAWING W-5



SEDIMENT RATINGS
DRAWING W-4

NGARURORO RIVER
SUPPLY to EXTRACTION BALANCE

CHART 7



The supply of gravel by the river to the natural sink reach was found by repeat surveys of cross sections along the river channel. Volumetric changes between surveys gave the supply rate for that period. Sediment rating curves for bed material (sediment transport to flow) were drawn up from estimates of sediment transport from empirical transport formulae. These rating curves were then applied to the continuous flow record at the stage recorder site and calculated transport rates over periods of time compared with actual supply, as given by the volumetric calculations. Consistent results were obtained over a number of survey periods, and the most appropriate formula could be determined and/or calibrated.

Sediment supply estimates from measured storage in natural sinks and from sediment transport ratings applied to continuous flow records.

SEDIMENT TRANSPORT - BED MATERIAL

RIVER	OVERALL GRADE	BED MATERIAL d ₅₀ (m)	DOMINANT FLOW Q ₂ (m ³ /s)	AVERAGE DEPTH Q ₂ (m)	AVERAGE WIDTH (m)	ANNUAL SUPPLY (m ³)		
						M-P & M	E & H	VOLUME BALANCE
WAITOHU	0.0150	0.075	50	1.0	15 - 20	1700		
TAUHERENIKAU	0.0075	0.050	290	1.5	100-150	70000	7000	60000
WAIKANAE	0.0045	0.045	160	1.5	40	20000 - 40000	4000 - 8000	5000
TUKITUKI	0.0045	0.030	135	0.75	75	40000		100000
OTAKI	0.0040	0.070	960	1.75	150 - 200	20000 - 40000	3000 - 7000	50000 - 100000
WAIPAWA	0.0040	0.025	370	1.0	200	160000		
NGARURORO	0.0040	0.015	875	1.0	350	275000 - 90000	100000 - 250000	170000
HUTT	0.0035	0.050	760	3.0	80	30000 - 60000	7000 - 12000	75000 - 100000
MANGATAINOKA	0.0030	0.040		2.5	40 - 60	40000 - 80000	4500 - 6500	
OHAU		0.040				5500		4500
ESK	0.0025	0.010	215	3.0	45	10000	6000	10000
TUTAEKURI	0.0020	0.010	500		150			50000

This table summarises sediment supply calculations on a range of gravel bed rivers in NZ.

Different formulae may be appropriate, depending on the nature of the gravel bed, and especially its sand content and degree of armouring.

Where there is a natural sink on a floodplain (by the coast) then channel cross section surveys can be used to determine the sediment materials brought down by the river, and these volumes can be used to calibrate sediment transport formulae – which have been applied to a continuous flow record.

