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Title **Stratigraphic columns for the Neogene succession exposed in central parts of Hawke's Bay Basin, eastern North Island, New Zealand**

Operator

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Date 2007

Summary This report is a compilation of stratigraphic columns for geological sections and outcrops of Neogene sedimentary units in central parts of Hawke's Bay Basin, eastern North Island, New Zealand. The columns have been prepared as part of a basin analysis investigation undertaken by the Sedimentary and Petroleum Geology Research Group in the Department of Earth and Ocean Sciences at the University of Waikato and have been compiled into a common format from six recent MSc and PhD theses to make the information more readily available, principally to assist hydrocarbon exploration activities in the region. The columns represent a level of detail underpinning a rationalized lithostratigraphy of the Neogene basin fill. The systematic lithostratigraphic description of the basin fill is given in a companion report (Bland et al. 2007).

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by

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2007

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Summary

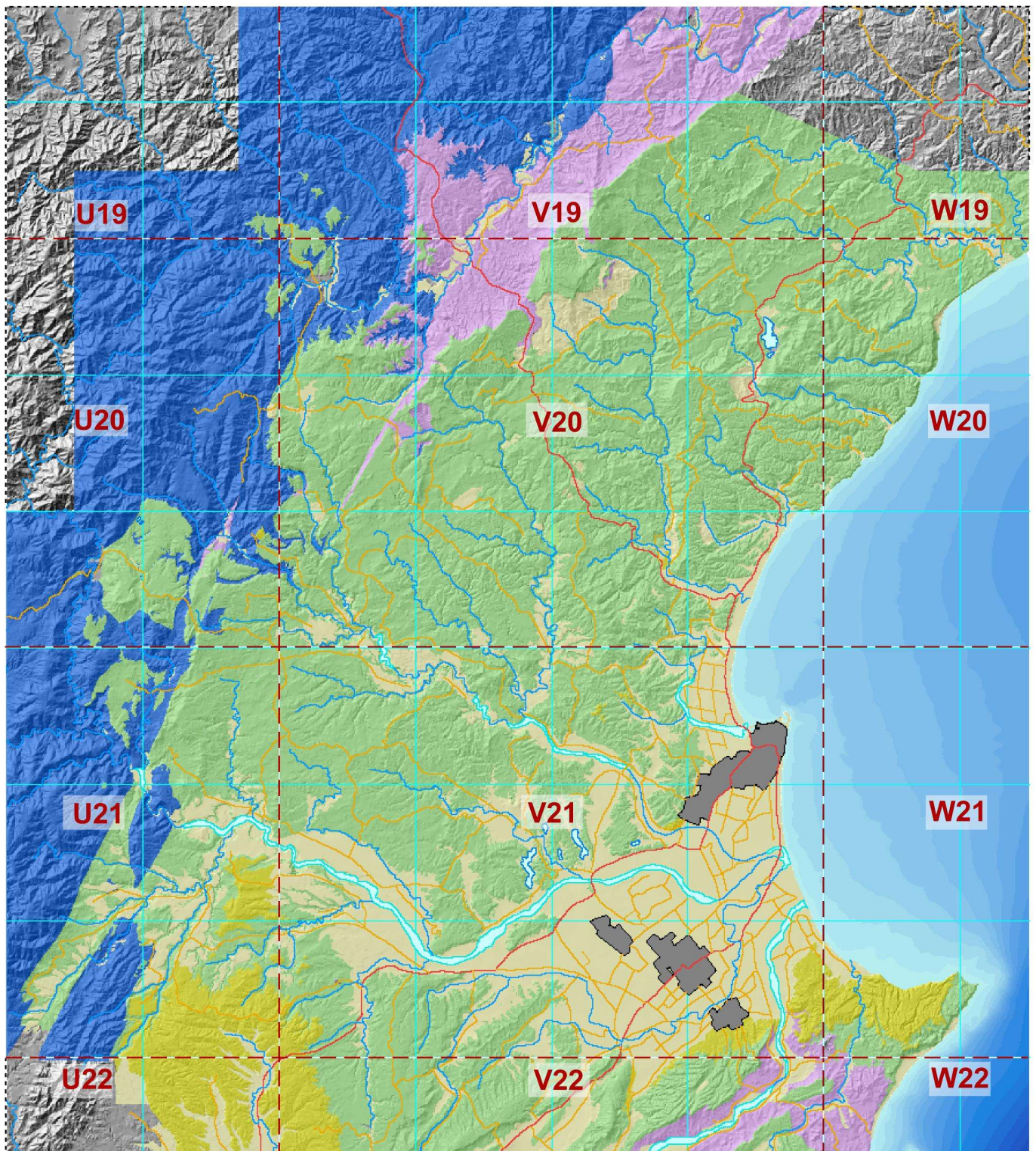
This report is a compilation of stratigraphic columns for geological sections and outcrops of Neogene sedimentary units in central parts of Hawke's Bay Basin, eastern North Island, New Zealand. The columns have been prepared as part of a basin analysis investigation undertaken by the Sedimentary and Petroleum Geology Research Group in the Department of Earth and Ocean Sciences at the University of Waikato and have been compiled into a common format from six recent MSc and PhD theses to make the information more readily available, principally to assist hydrocarbon exploration activities in the region. The columns represent a level of detail underpinning a rationalized lithostratigraphy of the Neogene basin fill. The systematic lithostratigraphic description of the basin fill is given in a companion report (Bland et al. 2007).

Introduction

Numerous naturally exposed geological sections and outcrops of Neogene (Miocene to Quaternary) strata in central parts of Hawke's Bay Basin, some associated with road cuts, have been described in detail as part of a basin analysis investigation undertaken by University of Waikato researchers. This report brings together in a common format the stratigraphic logs for this investigation, most of which appeared initially in four MSc (Boyle, 1987; Graafhuis, 2001; Baggs, 2004; Dyer, 2005) and two PhD theses (Caron, 2002; Bland, 2006). The report is a companion to another Petroleum Report entitled: "Systematic lithostratigraphy of Neogene strata exposed in central parts of Hawke's Bay Basin" by Bland, Kamp and Nelson (2007), which comprehensively describes the formal lithostratigraphy of much of the basin. The stratigraphic logs reproduced here form an important level of detail underpinning rationalisation of the lithostratigraphy of the basin fill. New geological maps (1:50,000 scale) for central parts of Hawke's Bay Basin show the distribution of the formations defined for the basin and many of the structural elements involving the Neogene succession. This compilation does not include stratigraphic columns described by D. Haywick for the Tangoio Block between Tutira (on State Highway 2) and the lower Esk Valley (State Highway 5), which are too numerous (102 columns) and closely spaced to include here.

Stratigraphic nomenclature

The Neogene succession in central parts of Hawke's Bay Basin is organized into three groups (Tolaga, Mangaheia, and Kidnappers) (Fig. 1), each containing numerous formations and members (Fig. 2). The Tolaga Group is of Miocene age and crops out in the Mohaka and Te Hoe River valleys in northwestern parts of the map area. The Mangaheia Group is of Pliocene to Early Pleistocene age, is very broadly distributed in the basin, and the majority of the stratigraphic logs reproduced here describe components of this group. The Kidnappers Group is of Middle to Late Pleistocene age and underlies terrace remnants and the Heretaunga Plains. Stratigraphic logs are not included here for sections through this group, but they mainly contain undifferentiated conglomerate units and associated sandstone, mudstone and lignite.



Legend

- Late Quaternary and Holocene deposits
 - Kidnappers Group
 - Mangaheia Group
 - Tolaga Group
 - Mesozoic Basement (mz)
- V21
NZMS sheets

Fig.1. Map showing the distribution of the three lithostratigraphic groups forming the late Neogene succession in central parts of Hawke's Bay. Also shown is the extent of Late Quaternary and Holocene deposits, and the extent of NZMS 260 1:50,000 map sheets.

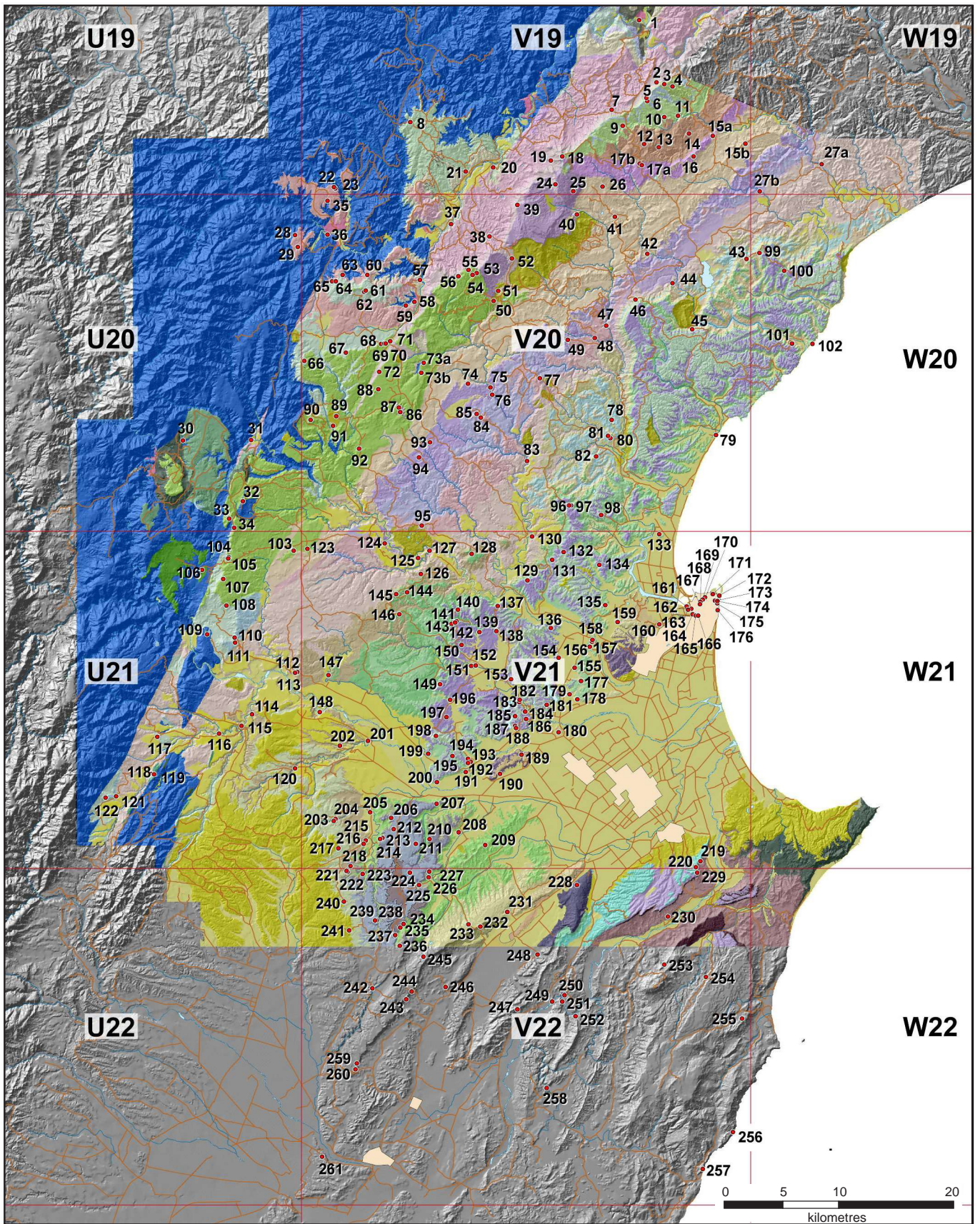


Fig. 2. Location of sites for which stratigraphic columns are reported here. Also shown is the distribution of lithostratigraphic formations (Legend on following page) within the Tologa and Mangaheia Groups (Fig.1.).

LEGEND

Units in the north and west

	Kaiwaka Formation
	Petane Formation
	Esk Mudstone
	Waipunga Formation
	Matahorua Formation
	Pohue Formation
	Te Waka Formation
	Puketitiri Formation
	Pakaututu Formation
	Mangatoro Formation
	Blowhard Formation
	Titiokura Formation
	Mokonui Sandstone
	Waitere Formation
	Te Haroto Formation
	Poamoko Formation
	Whakamarino Formation
	Torlesse composite Terrane

Units in the south and east
















	Late Quaternary deposits
	Taupo Pumice
	Kidnappers Group
	Poutaki Formation
	Okauawa Formation
	Kereru Formation
	Mount Mary Pebbly Limestone
	Sentry Box Formation
	Mason Ridge Formation
	Makaretu Mudstone
	Pakipkai Limestone
	Black Reef Calcareous Sandstone
	Taradale Mudstone
	Undiff. "Te Aute" limestone and mudstone beds
	Undiff. Early Pliocene-Cretaceous

Fig. 2. (continued). Legend for geological map (previous page) showing the distribution of formations in central parts of Hawke's Bay Basin.

As part of the work on the central parts of Hawke's Bay Basin there has been extensive investigation of the lithostratigraphy of the basin fill. This work has demonstrated the correlation of often lithologically diverse units across the region. An outcome has been simplification or rationalisation of the prior lithostratigraphic nomenclature. Figure 3 shows how the formation and member names for particular parts of the basin correlate to units in other parts of the basin. Readers are referred to the companion volume on systematic lithostratigraphy for full description of the stratigraphy and correlations. The location of all stratigraphic logs reported here are shown on Fig.2, and for individual 260 map sheets in Figs 4 – 11.

Age and timescale

The stratigraphic logs show age expressed in terms of epochs and New Zealand stage names. The stage designations have been chiefly determined from macrofossil content, and for selected fine-grained (mudstone) units, from their microfossil content. Beu (1995) provides the most recently published and comprehensive biostratigraphic synthesis for macrofossil fauna in the basin and wider region, and has been used to help assign the formations and members to the various New Zealand stages. The most recent synthesis of the correspondence between the New Zealand Stages and the International timescale has been published by Cooper et al. (2004), and readers are referred to Chapters 12 & 13 therein for further information. A paleomagnetic investigation of the Late Pliocene – Early Pleistocene Petane Formation exposed in the Tangoio block has been undertaken by Peter Kamp and Gillian Turner. It shows that middle to lower parts of this formation accumulated during the early part of the Matuyama Subchron, and that the transition to the Olduvai Subchron is located in the lower part of the Devils Elbow Mudstone Member. There seems little prospect of establishing the upper transition of the Olduvai Subchron as this boundary probably lies in the coarse grained Kaiwaka Formation. Lithologies in the Mangaheia Group, with the exception of the Taradale Mudstone, are too coarse grained and do not have sufficient continuous exposure to have encouraged us to undertake more extensive paleomagnetic sampling to establish a magnetostratigraphy to refine absolute age control for the succession. There is potential to apply paleomagnetic dating within the thick Late Miocene Rakaita Siltstone Member, Waitere Formation. Radiometric dating of rhyolitic tephra, especially within the Mangaheia Group, offers the potential to establish numerical ages, but this has not been attempted as part of this investigation. The stratigraphic positions of numerous tephra are shown on the stratigraphic columns reproduced here.

Stratigraphic columns

As the stratigraphic columns originate from four MSc and two PhD theses, there are inevitably different styles in their presentation. In an effort to unify the column presentations here, they have been imported into a common template, with key information about the location of the various sections and outcrops standardized. Clearly indicated on each column is the author of the data. In addition to the descriptive text included on the columns, the different authors have all assigned facies codes to their various depositional units. The facies codes are different between the

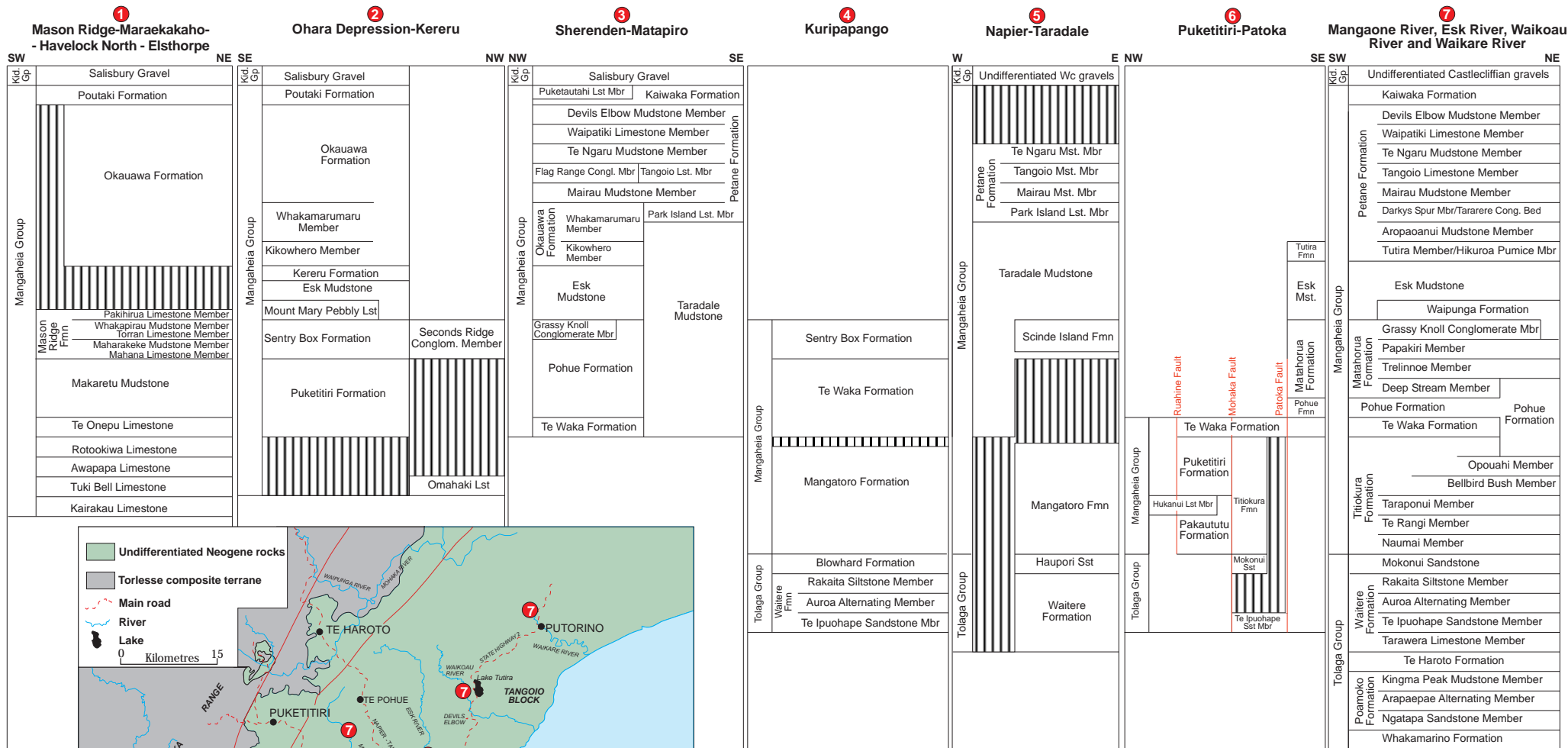


Fig. 3 Summary of stratigraphic nomenclature proposed by Bland et.al. (2007) for the late Neogene succession in central parts of Hawke's Bay.

various authors, and to help get around these differences, facies tables related to each author's codes have been reproduced in this report (Tables 1 – 5). Readers will need to cross reference between the codes on the named logs and the corresponding descriptions in the appropriate author's table. The related theses have detailed descriptions of the facies, their vertical and horizontal extents, the facies associations, and interpretation of the depositional paleoenvironments, and readers will need to access the theses for this level of detail, or refer to related publications (e.g. Caron et al., 2004; Bland et al., 2004). Arranged together with the facies tables in this report, are the lithology, faunal, and other symbols that have been used by the various authors in the cartographic production of their graphic log legends (Figs 12 – 17).

Arrangement of the columns in the report

Maps showing the location of each of the stratigraphic columns are included in the report (Figs 2, 4 – 11) to help readers to generally locate the corresponding section or outcrop. Also shown on these maps are the NZMS 260 1:50,000 topographic map boundaries for central parts of Hawke's Bay. The various columns are arranged within this report within these NZMS 260 sheets, and follow a west-to-east and north-to-south pattern in their arrangement. A spreadsheet (Table 6) reproduced in the report enables readers to cross reference between the column numbers shown on the location maps and the various author's (originator's) column numbers.

Acknowledgements

We acknowledge the assistance of Betty-Ann Kamp and Jeremy Titjen in bringing the stratigraphic columns into a common template and arranging the columns into systematic order in this report, and for the production of this report. Throughout many years of undertaking research on eastern North Island sedimentary successions, University of Waikato staff and students have benefited from scientific assistance and interaction with Alan Beu and Dave Francis, which we gratefully acknowledge. We also acknowledge the assistance of Austin Hendy with macrofossil identifications and paleoecological interpretations, and Arne Palletin for assistance with some field descriptions. We thank the various land owners and farm managers in central parts of Hawke's Bay for kind access to their properties to undertake the stratigraphic descriptions, associated sedimentological investigations, and geological mapping, and in some cases for the provision of accommodation. Funding to undertake different aspects of our research in Hawke's Bay has been provided by the New Zealand Foundation for Research Science and Technology (Contract UOWX0301), and the Marsden Committee (Contract UOW801) to the University of Waikato, which has been gratefully appreciated.

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