GREYWATER SYSTEM INSTALLATION AT THE KŌKIRI CENTRE, WHAINGAROA

AUE TE PIRO

Te Waipara kia kaua e Paatu ki te Wai Maori

STRENGTHENING THE RESILIENCE OF MARAE AND COMMUNITY WATER AND WASTEWATER INFRASTRUCTURE

WELCOME FROM THE PROJECT LEADER

Welcome to the first issue of our project newsletter which will be produced on a 6-monthly basis for the project duration. The newsletter will provide regular updates to project partners and interested stakeholders as well as providing insight to our findings along the way. Please share this information with any other communities that may be interested. We hope that through collaboration and learning from each other's experiences that we may improve wastewater management systems at marae and similar communities. Any feedback on the newsletter is gratefully received, along with any suggestions for improvements or articles. To subscribe to receive this newsletter or to provide comments and feedback, please contact any of the project team referred to in this newsletter.

Project overview

NIWA has been fortunate to receive funding from the Ministry of Business, Innovation and Employment to provide research to address the water and wastewater needs of marae and rural communities. This programme will:

- Provide more comprehensive information about water usage and wastewater generation patterns from different marae around New Zealand.
- Monitor the performance of greywater treatment solutions implemented to reduce wastewater loads on marae infrastructure.
- Develop prototype wetland and soil-based treatment systems that reduce risks to human health and the environment.
- Design a web-based decision support tool that will help communities assess their water and wastewater needs.
- Assist marae communities to implement reliable and enduring water and wastewater solutions.

The project is being led by NIWA and is scheduled for completion in late 2016.

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IN THIS ISSUE

Water and Wastewater Challenges for Marae

In this issue we present some of the findings of an investigation into the issues and challenges of wastewater management from 22 marae.

Marae Water Usage Monitoring

In this issue, we provide an overview of the marae water usage monitoring programme, outline what we hope to achieve and why we think the information is needed by marae to inform the design of better water and wastewater systems.

Water and Wastewater Challenges for Marae

Summary of article prepared for New Zealand Land Treatment Collective Conference 2014

INTRODUCTION

Supply of adequate drinking water and the removal of polluted waters are two fundamental infrastructural needs of communities – so it goes without saying that the generation, collection, treatment and disposal of waste is a central and necessary component of a functioning marae.

Since 2009 Tainui Awhiro, Ngāi Tai, Te Roroa, NIWA and other marae management committees around the country have been working together to characterise water and wastewater challenges for marae, and identify treatment options that better meet the aspirations of Māori for improved water and wastewater management.

This article presents some of the findings of this initial research, particularly the work completed to better understand wastewater management challenges for marae.

TORERE MARAE, BAY OF PLENTY.

METHOD

A questionnaire was used to guide face to face interviews with marae representatives. The questionnaire aimed to obtain site specific information regarding marae usage, facilities and water and wastewater management systems.

A total of 22 questionnaires were completed by marae situated mainly in the North Island; the majority of whom were situated in rural locations in the Tainui (45%) and Te Tai Tokerau (26%) regions.

TORERE MARAE ABLUTION FACILITIES.

SO WHAT'S DIFFERENT ABOUT MARAE WASTEWATER?

The questionnaire confirmed many characteristics of marae usage, including the many types of events that marae host, and that marae usage (in terms of numbers of people) is also highly variable. The key difference in marae wastewater production is the variability in flows and loads that can be experienced throughout the year:

- Over a year participating marae hosted between 8 and 100 events.
- Hosted events typically lasted between 1 and 3 days.
- Tangihanga were associated with the highest influx of people, with estimates of between 20 and 500 people present at the marae at any one time.
- Unveilings, birthdays, weddings and reunions occurred less often, but also involved very large numbers of people (between 30 and 400 people).

FINDINGS ABOUT MARAE WASTEWATER SYSTEMS?

Key findings of the questionnaire regarding existing marae wastewater systems included:

- Grey and black water are often managed through a combined wastewater system.
- Marae wastewater treatment and dispersal systems typically consist of septic tanks draining to soil infiltration fields.
- Approx. 55% of respondents reported issues with their wastewater systems (20% reported frequently having issues and 35% reported sometimes having issues).
- There is often limited funding available for system maintenance and upgrades.

The questionnaire responses were considered alongside the results of a survey by Te Puni Kōkiri (TPK, 2012; 544 responses) to provide a fuller view of the status of marae water and wastewater systems, needs and aspirations.

The findings of the TPK study were similar to those from the NIWA questionnaire. In terms of a more nationwide picture, TPK (2012) highlighted that of the 352 respondent marae who have their own septic tank (or similar) system about 76% of these reported that their system was adequate for the needs of the marae, while 24% reported that their septic system was inadequate.

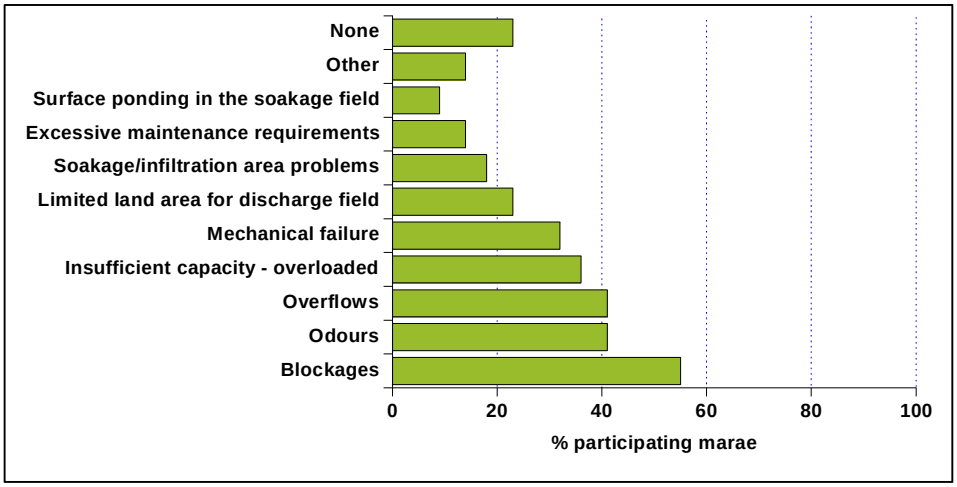
ISSUES AND CHALLENGES FOR MARAE SYSTEMS?

The types of problems participating marae had with their systems included:

- Excessive septic tank maintenance requirements (i.e., emptying more than once per year).
- High incidences of blockages.
- High incidences of overflows.
- Odours from the system.

Other issues reported with marae wastewater systems included:

- Distance/cost from service centre.
- Land slips/movement.
- Kinked pipes restricting water flow.
- Heavy rains and flooding (high water table and close to surface waters).
- Can't put hāngi down in the ground due to contaminated ground or high water table.



Types of problems participating marae have with their wastewater treatment systems.

Experimental reed bed installed at Pukete WWTP and currently being monitored.

- Lack of knowledge (or plans if they exist) of where existing plumbing and land discharge systems (e.g., from the septic tank) goes and lack of information being passed onto the current marae management committee.
- Existing system does not meet current codes/standards (e.g., undersized septic tanks).
- No grease trap for kitchen wastewaters.

Almost all participating marae reported multiple types of water bodies in close proximity. 68% of marae participating in the NIWA survey perceived that there were potential issues with the way their wastewater was dispersed locally.

About half the marae who responded to the survey plan to upgrade their wastewater systems, including shower and toilet facilities over the next 1–3 years. This compares with 40% of marae in the TPK survey that noted their shower/toilet facilities or wharekai required attention.

While many marae communities are aware of local wastewater issues, addressing the issues is often thwarted by a lack of tenable and affordable solutions. This is particularly the case in rural/isolated communities with constraints on land availability, sensitive receiving environments, and high marae usage.

In addition, ageing infrastructure (and need for replacement and/or upgrade); increased pressure on land and the receiving environment along with development aspirations further highlights the need for innovative and robust wastewater management solutions.

While there are many interrelated issues that need to be addressed to improve this situation, this project has highlighted an appetite and need for practical demonstrations of improved water management approaches in different communities and situations.

WHERE TO FROM HERE?

Unsurprisingly, marae generally have limited wastewater treatment and disposal alternatives available to help them cope with large events and effectively manage the resulting variation in wastewater flows and loads.

The questionnaire results confirmed the need for further consideration and development of robust engineering design parameters (including appropriate design flow and load assumptions) that reflect the unique challenges and characteristics of wastewater from marae and similar communities.

The research being conducted (as part of the "*Strengthening the Resilience of Marae and Community Water and Wastewater Infrastructure Project*") aims to assist in developing robust design parameters for marae on-site wastewater systems and provide real world examples of robust wastewater management systems that address the unique challenges of marae and similar communities.

The specific work underway to address these needs include:

- Further monitoring and assessment of typical marae water usage and occupancy.
- Wastewater monitoring, installation of trial greywater treatment wetland, and continued performance monitoring at the Kōkiri Centre, Whāingaroa.
- Developing auditing and decision support tools that will better assist Māori to identify and implement wastewater management options that are effective and consistent with tikanga Māori.

References

Te Puni Kōkiri (2012). Te Ora O Te Marae I 2009 – The Status of Marae in 2009. Te Puni Kōkiri Report.

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Williams, E.K., Rickard, D., Maxwell, K.H., Patuawa, T., Iti, W., Tanner, C., Stott, R. (2012) Status of marae water and wastewater infrastructure: Results of a questionnaire survey. August 2012. *NIWA Report*.

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NEWS IN BRIEF

Kōkiri Centre Greywater System presented at WaterNZ Conference

James Sukias (NIWA) presented a paper on the greywater wetland installed at the Kōkiri Centre at Whāingaroa (Raglan) at the WaterNZ Conference in Hamilton on the 16 October 2013.

The greywater treatment system was designed and installed as a demonstration site and provides a real world example of potential improvements to be made to marae wastewater systems through grey-water diversion from existing wastewater infrastructure, and dedicated construction of greywater treatment systems.

Watch out for the next issue of the Project Newsletter for a full article on the work completed at the Kōkiri Centre. For more info on WaterNZ visit: www.waternz.org.nz

NZ Land Treatment Collective

The NIWA Project Team presented a poster paper to the NZ Land Treatment Collective conference in March 2014. The poster summarised the results of the questionnaire reported on in this issue of the Project Newsletter.

The paper also presented general design criteria that may apply to marae wastewater treatment system design. For more info on the NZ Land Treatment Collective see: http://www.scionresearch.com/general/new-zealand-land-treatment-collective

Acknowledgements

NIWA wish to acknowledge Torere Marae for allowing the use of the photographs of Torere Marae in this publication.

Marae Water Usage Programme

As part of the ongoing research project, NIWA have extended the marae water usage monitoring programme to include a further 8 marae. The marae are all located in the North Island and include marae from Te Taitokerau, Tainui, Maniapoto, and Te Moana ā Toi.

WHAT IS THIS MONITORING PROGRAMME FOR?

The long term aim of the project is to better inform system designers and help refine or establish (if necessary) improved design assumptions for marae water and wastewater systems (e.g., improving water use efficiency; separating greywater from black water and treating greywater in innovative ways, thus reducing the load on existing wastewater systems). As well as better understand potential wastewater flow reductions from a range of behavioural and physical system initiatives, and to feed into other aspects of the overall research project.

A direct and immediate benefit of the monitoring is to help identify significant leaks in the marae plumbing and fixtures and quantify how much water was being wasted as a result, which in turn allows for repairs to be undertaken.

WHAT DESIGN ADVICE IS AVAILABLE FOR MARAE CURRENTLY?

There is very limited design advice provided for marae wastewater systems.

The New Zealand Standard for onsite domestic wastewater management (AS/NZS 1547: 2012) provides typical domestic wastewater flow allowances for commercial premises in NZ (including motels/hotels; community halls; and camping grounds). But no guidance for marae wastewater design.

A number of District and Regional Councils provide guidance on marae wastewater generation assumptions, including Horizons Regional Council, Gisborne District Council, and Auckland Council. TP58 (Auckland City Onsite Wastewater System Design and Management Manual, 2004) provides the following advice:

Description	WW Generation
Day only visitors	40 litres per person
Day plus overnight visitors	150 litres per person

The TP58 flow figures assume that lunches and lunch/dinners will be served, and that overnight visitors have access to showers but not to laundry facilities. TP 58 also advises that "Water meter readings should be installed to provide added certainty to the accuracy in the design flow allowance."

WHAT IS INVOLVED?

A number of flow meters are installed at specific locations on the marae potable water system (see front page photo for example water meter installation). The flow meter data is either transmitted (via telemetry) back to NIWA, or saved locally for periodic downloading. These installations provide real time data on water used and therefore wastewater generated by the marae.

Each marae also keeps a record of marae usage to accompany the water flow monitoring and submits the information back to NIWA:

- Type of event (e.g., marae hui, tangihanga, birthday, working bee).
- Duration of event.
- Numbers booked for event.
- Estimated actual numbers in attendance:
  - Day only visitors.
  - Day and overnight visitors.

Both the marae water usage monitoring and recording and marae usage/occupancy data are critical to the success of this monitoring programme.

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