What do we do with all of the POO?

Minimising Public Health Risks from Human Waste After a Large Wellington Fault Earthquake

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QuakeCoRE | Massey University | GNS Science | The University of Auckland | Centre for Integrated Biowaste Research | Wellington Region Emergency Management Office | Joint Centre for Disaster Research

Outline

- **Defining Emergency Sanitation**
- **Talking about Poo- Phobias and Emotions of Disgust**
- **Why is Emergency Sanitation important:**
- **The Sanitation Service Chain- A framework for understanding the challenge and options for Emergency Sanitation**
- **Emergency Sanitation Sector Workshop – November 2019**
- **Parallel Research into the effectiveness of a composting toilet system for emergencies.**

Defining Emergency Sanitation

In this context: The safe management of human waste in an emergency or disaster context.

When conventional systems are disrupted or unable to be used, contained, transported or treated.

Applied in the RESPONSE and RECOVERY phases of the emergency management.

Talking about Poo- Phobias and Emotions of Disgust

- “Wider problems hindering the development of solutions to inadequate sanitation include inappropriate, top-down sanitation interventions that prioritize ‘hardware’ and neglect wider political ecologies and ‘software’ (socioeconomic, cultural) dimensions.”

Jewitt, S. (2011). Geographies of shit: Spatial and temporal variations in attitudes towards human waste. *Progress in Human Geography*, *35*(5), 608–626.

Talking about Poo- Phobias and Emotions of Disgust

"…in order for sanitation to be a central item on decision makers' agendas it is important that the squeamishness that surrounds the subject with silence and taboo is tackled head on... today's sanitary crisis requires that we dismantle the last great taboo, and learn to talk about... shit…"

Jewitt, S. (2011). Geographies of shit: Spatial and temporal variations in attitudes towards human waste. *Progress in Human Geography*, *35*(5), 608–626.

Why is Emergency Sanitation Important?

Access to safe sanitation is recognised as a basic human right (UN General Assembly ,2010)

Very little research has been done on emergency sanitation in a developed world context.

Imagine life without a toilet….for 12 months!

The Christchurch Experience……

https://www.showusyourlongdrop.co.nz/

The Wellington Situation……

"The hilly terrain of the Wellington region makes the provision of emergency sewage disposal particularly challenging and the community may be expected to be ***self-sufficient for a longer period*** *than that experienced by Christchurch residents following the Christchurch earthquakes"*

Wellington Lifelines Group 'Restoration Times' report – November 2012

The Sanitation Service Chain

A framework for understanding the complexity of the sanitation challenge

Capture | **Containment** | **Emptying and Transport** | **Treatment** | **Disposal or Reuse**

- Adapted from: Zakaria, F., Garcia, H. A., Hooijmans, C. M., & Brdjanovic, D. (2015). Decision support system for the provision of emergency sanitation. *Science of The Total Environment, 512-513*, 645-658.

The Sanitation Service Chain

	Capture	Containment	Emptying and Transport	Treatment	Disposal or Resuse
Bag in Bucket					
Long Drop					
Port a loo					
Chemical Toilet					
2 Bucket Compost Toilet					
Other					

Considering all of these factors:

Socio-cultural Technical Economic Environmental Vulnerable

Emergency Sanitation Sector Workshop – November 2019

Objectives:

1. **Current activities- an update from representatives on the work they are doing in this space and their respective plans.**
2. **Identify challenges, opportunities and gaps to improving the current preparedness and response strategies.**
3. **Identify points of collaboration between sector partners.**

Emergency Sanitation Sector Workshop – November 2019

Who attended:

Civil Defence and Emergency Management

Wellington and Regional council infrastructure managers

Public Health

Disability Advocacy

Academics and researchers

Water and waste water engineers

Local Iwi representatives

Emergency Sanitation Sector Workshop – November 2019

Key Discussion Points:

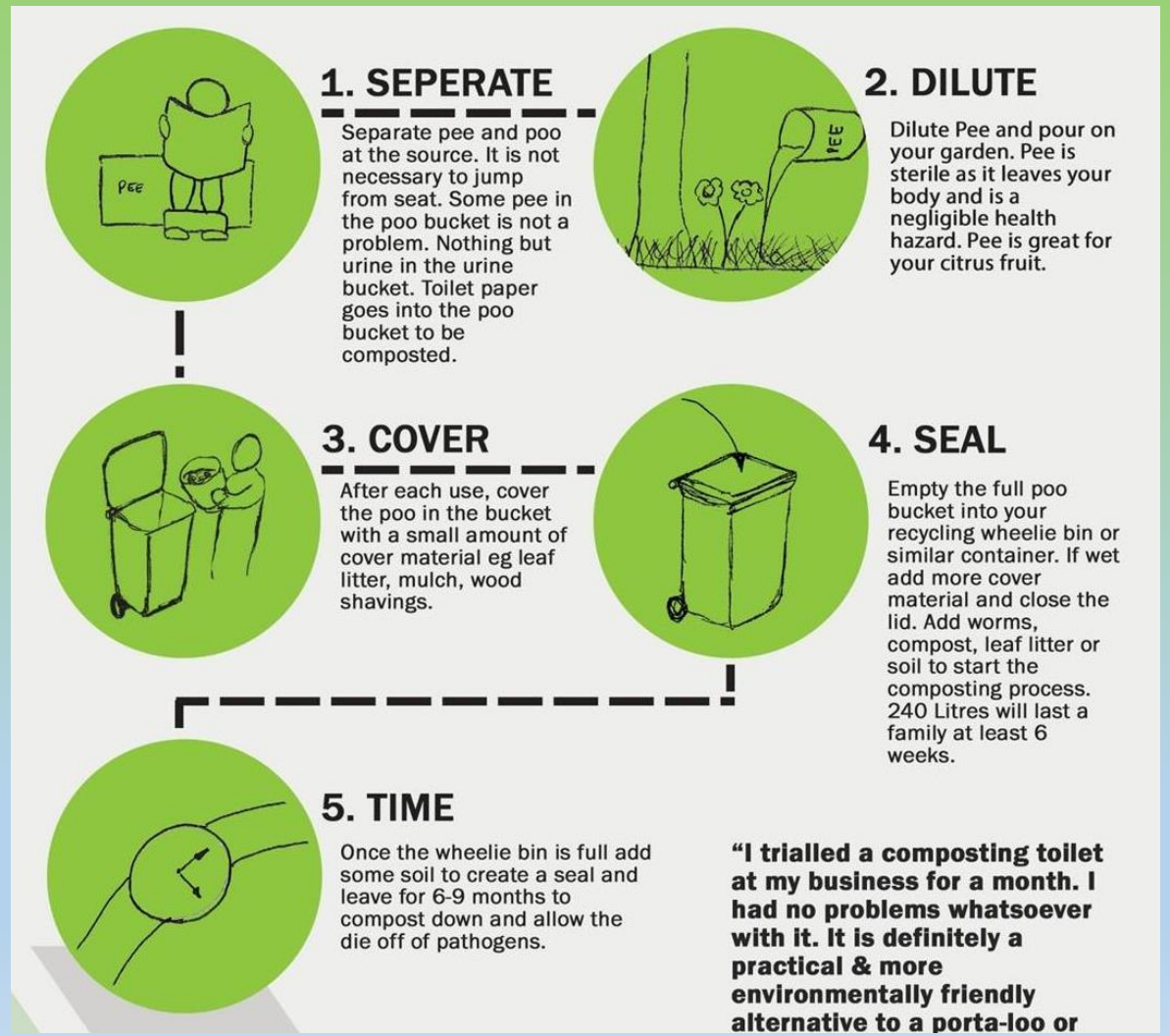
- **What key information needs to be part of a pre-disaster conversation?**
- **Challenges for the pre-disaster conversation**
- **What socially and culturally awkward norms do we need to consider when coming up with solutions?**
- **What will those that have lesser capacity do?**
- **What are some of the Tikanga Māori perspectives and planning for sanitation in disasters?**
- **Who is best to lead work on engaging communities and marginalised groups into the conversation about emergency sanitation?**

Emergency Sanitation Sector Workshop – November 2019

Summary Recommendations:

- **Use of informal terms- Wee and Poo in communications**
- **The Sanitation Service Chain is a useful framework**
- **The ‘community’ is diverse with different needs, perceptions, protocols on sanitation- Sanitation options and communication need to reflect this**

Parallel Research- Emergency Compost Toilet



The Method

+ Wood Shaving

+ Wood Chip

Set up Toilets in Homes and Businesses with Appropriate Carbon Source

Combine in Barrels at Massey Lab

+ Bokashi

- Bokashi

+ Bokashi

- Bokashi

Add in Bokashi Compost Activator as Required and Split into Buckets

Sample and Test at 0,3,7,14,21,35,49,56,63 Days for Indicator Bacteria Die-Off and Associated Chemical Analysis

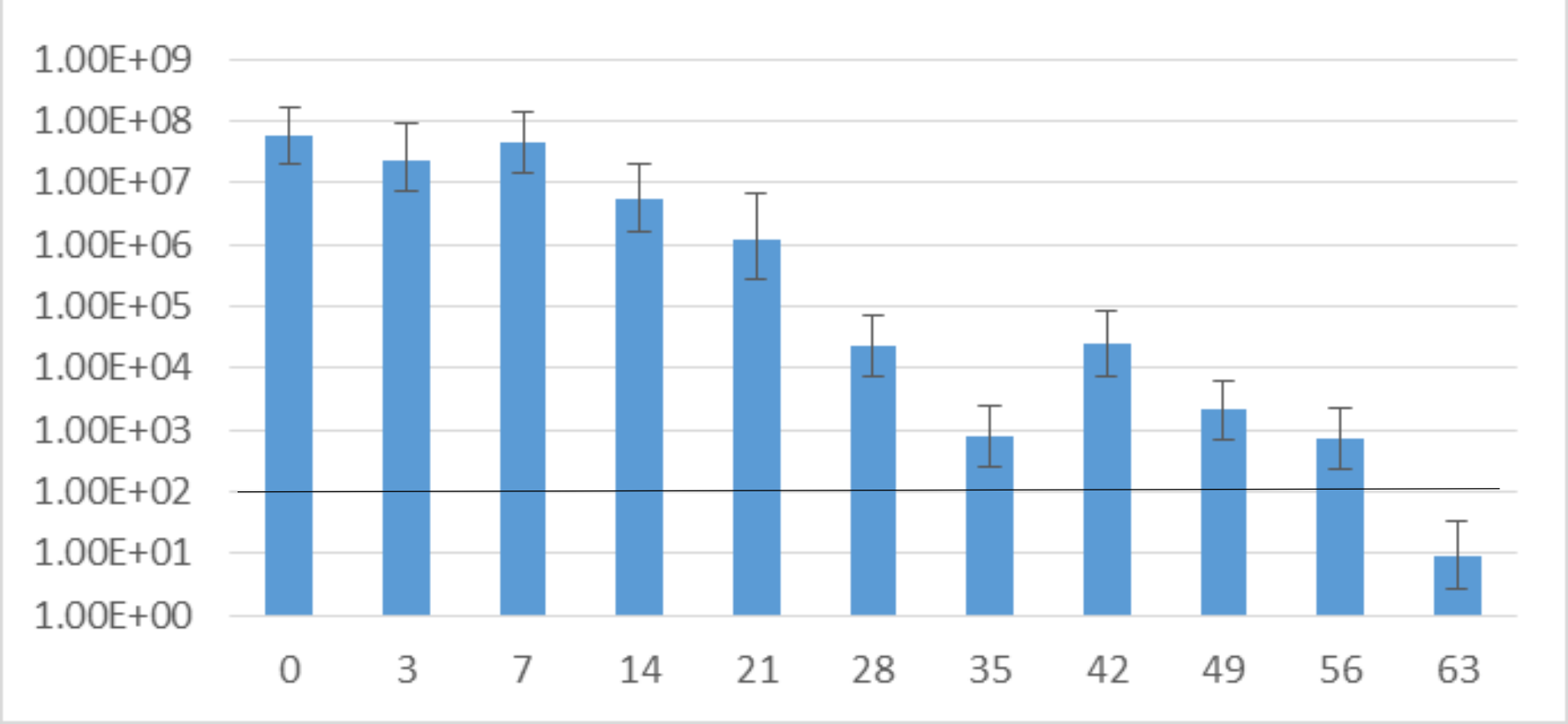
Conclusion:

Defining what is meant by 'Safe'

The Results

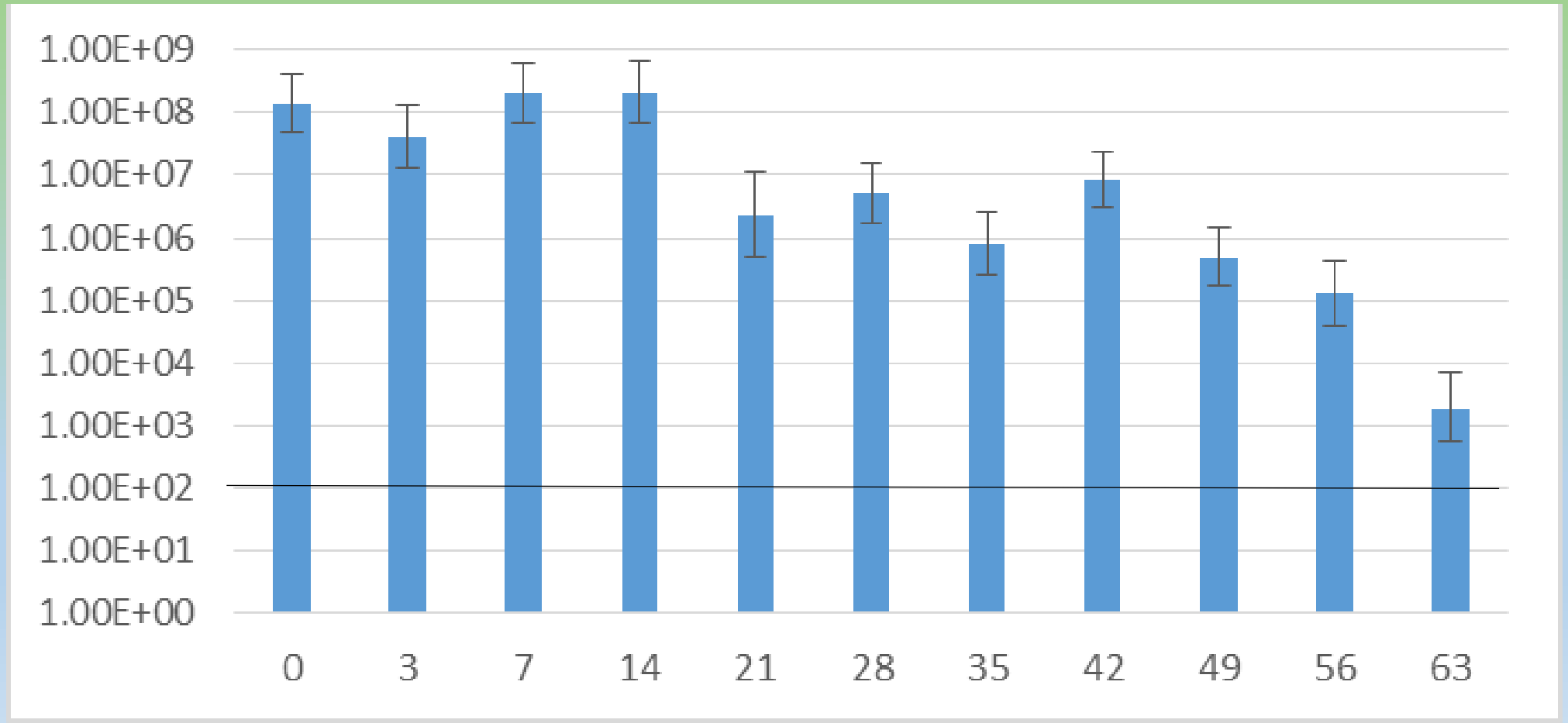
Of the 4 Variables only 1 showed significant pathogen die-off:

Pine Wood Shavings - No Bokashi added

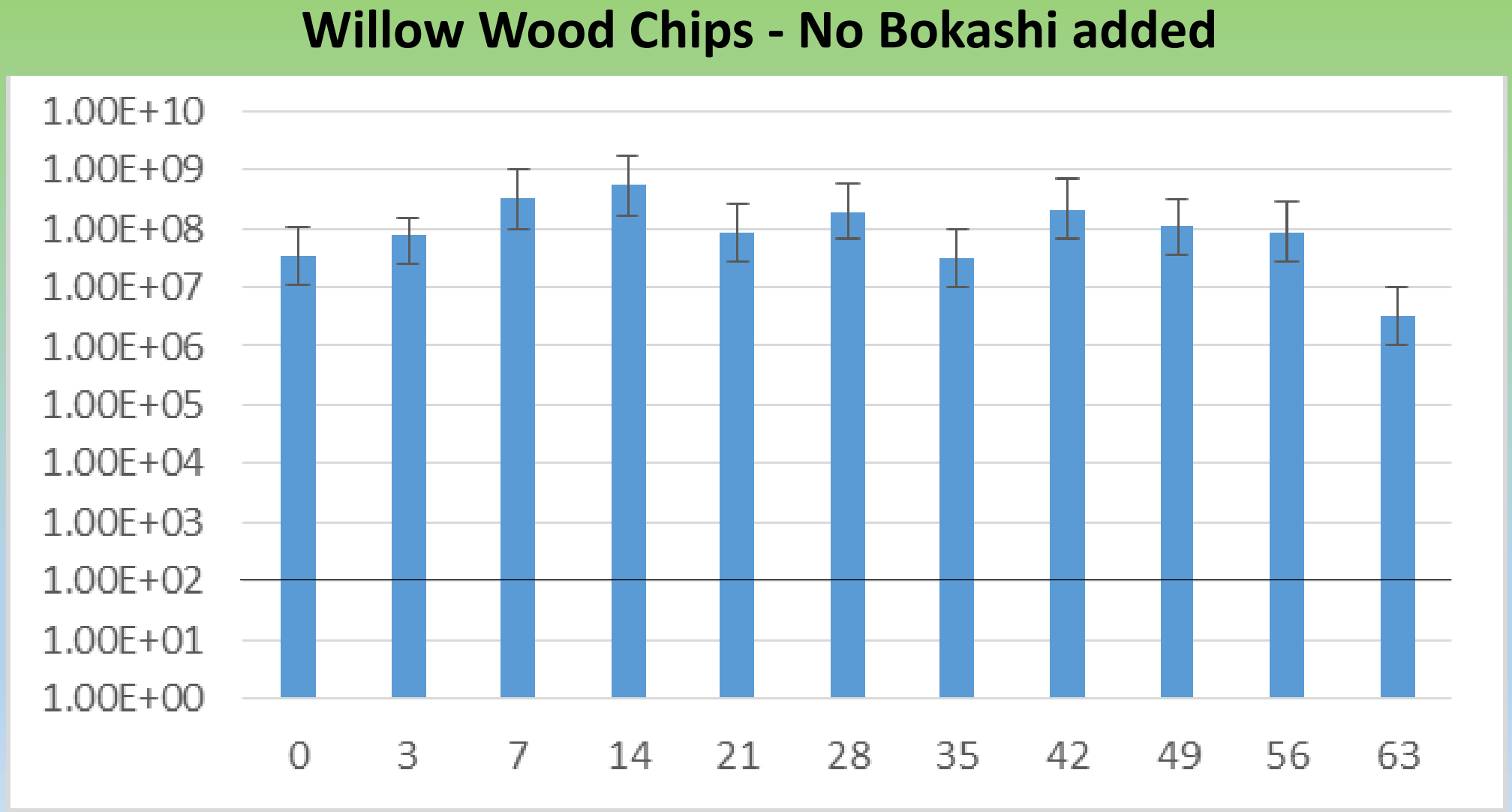


The Results

Pine Wood Shavings - With Bokashi added

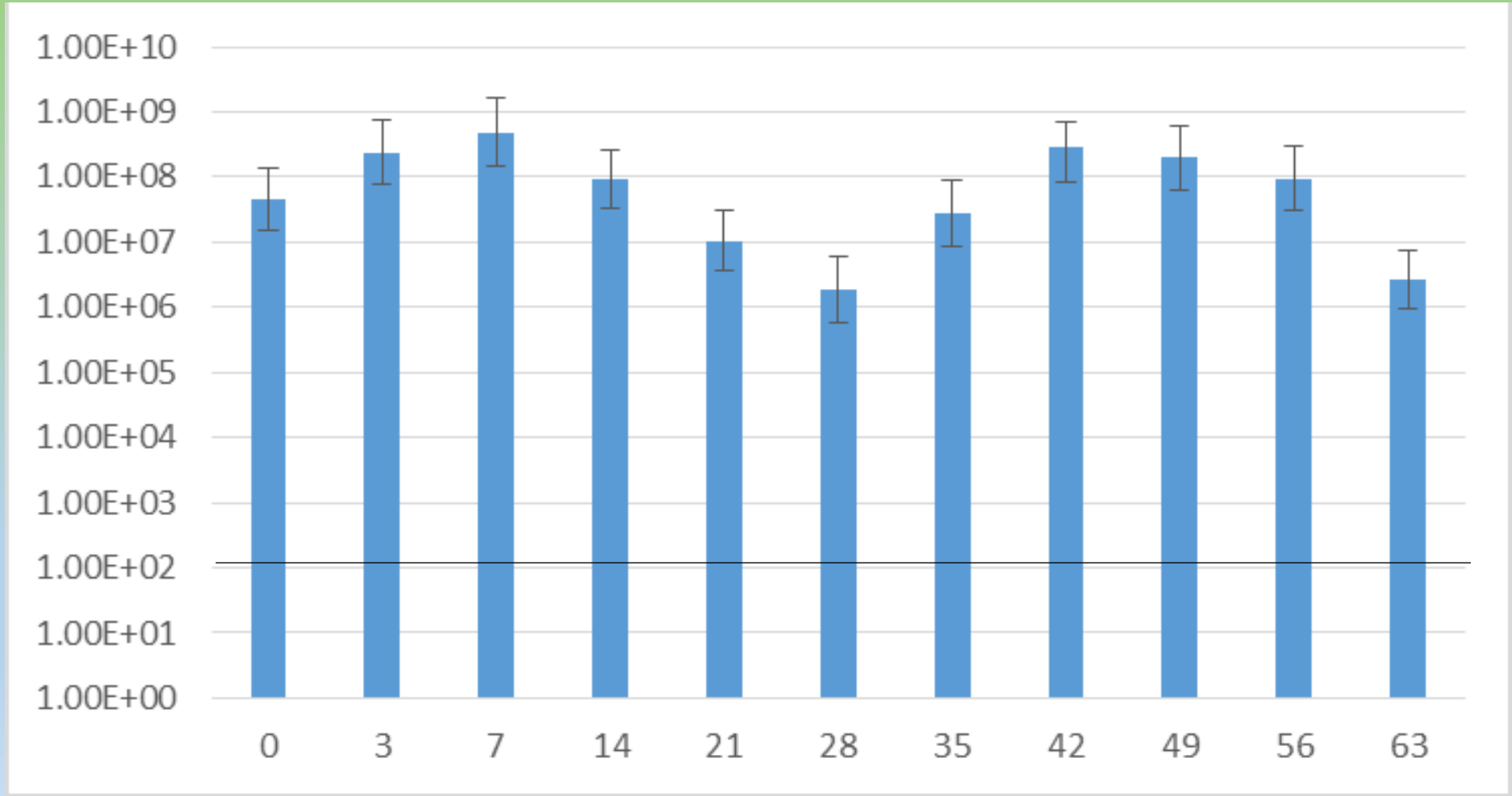


The Results


Willow Wood Chips - No Bokashi added
1.00E+10
1.00E+09
1.00E+08
1.00E+07
1.00E+06
1.00E+05
1.00E+04
1.00E+03
1.00E+02
1.00E+01
1.00E+00
0
3
7
14
21
28
35
42
49
56
63

The Results

Willow Wood Chips - With Bokashi added



Interpreting the Results

- Decline in MPN levels begins from day 14 with continual falls to day 63
- Changes in MC over time not significant- MC not a factor in this change
- Nearly 30% drop in Total N
- Ammonium increases from 0.4% to 1.1%
- At day 63 highest MPN of 3 replicates is 24. Biosolids guidelines safe level is 100.
- **ANOVA statistical analysis conducted on raw data shows no statistically significant differences in data.**

Conclusions

- **Using untreated pinus radiata shavings as a cover material and carbon source reduces the MPN E.coli count to below 100 in 9 weeks.**
- **Willow woods chips and Bokashi additives result in some reduction to E Coli levels but not to safe levels**
- **Meets NZ Bio-solids Guidelines for the safe application to land in 9 weeks**
- **Makes it possible for households to safely manage human waste onsite in an emergency situation.**

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