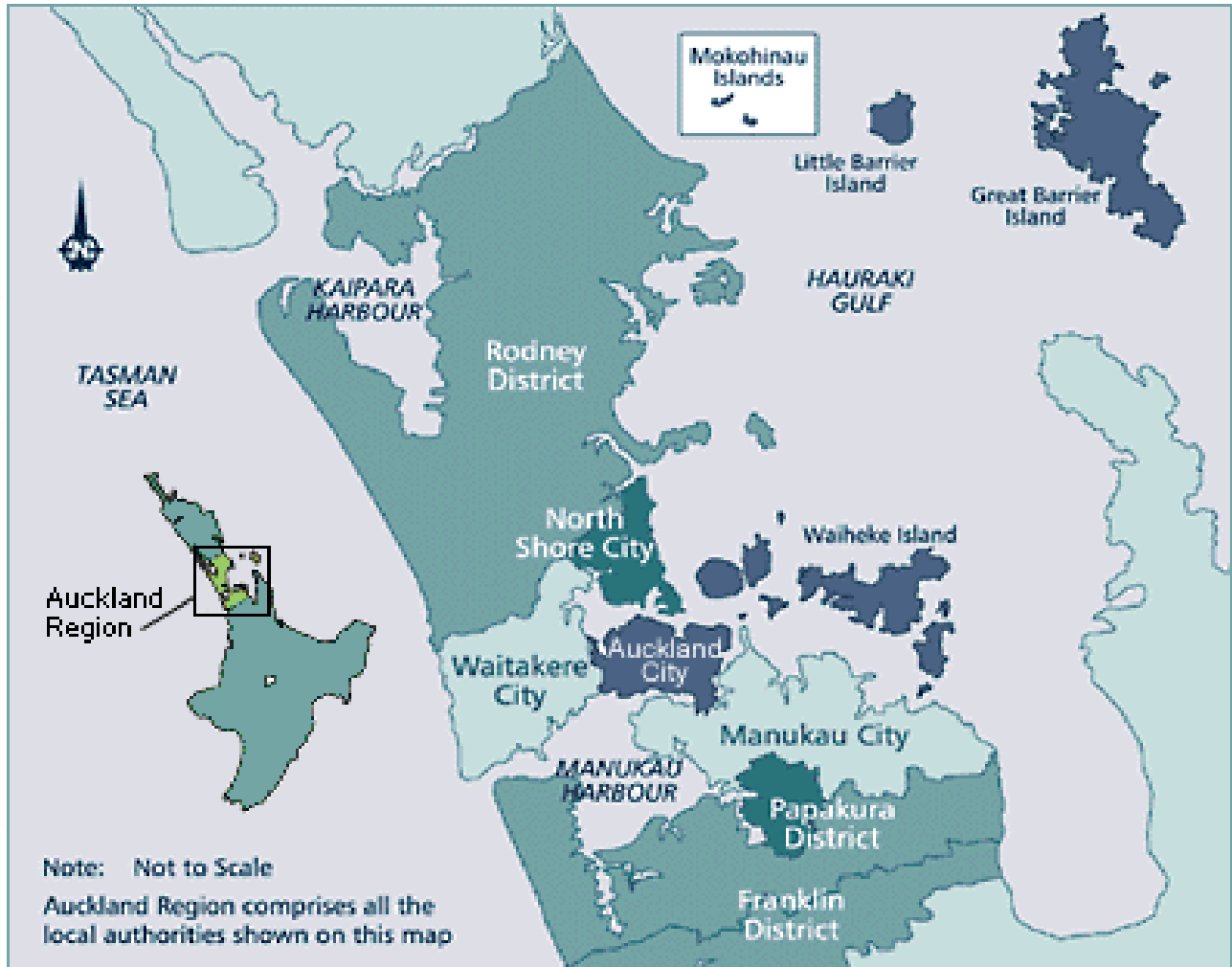


What is the Infrastructure Leakage Index (ILI) and how did Waitakere City Council manage to achieve an ILI of 1.0?



Presentation by Richard Taylor



Location of Waitakere City



Aerial view of Waitakere City

Overview of Presentation

- BenchlossNZ Project
- Components and Terminology of the Water Balance
- Infrastructure Leakage Index (ILI)
- Four Key Factors influencing water losses in distribution systems
- Initiatives Implemented at Waitakere City
- Management Aspects
- Summary

BenchlossNZ Manual and Software

- Project by Water Supply Managers Group (NZWWA)
- Initially published in April 2002 by NZWWA
- Updated in February 2008
- Introduced internationally accepted terminology including the water balance and '95% confidence limits' for components
- Introduced water loss performance measures including the Infrastructure Leakage Index (ILI)
- National resource for assessing and benchmarking water losses

Water Balance

Own Sources	System Input	Water Exported			Billed Water Exported to other Systems	Revenue Water
		Water Supplied	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption by Registered Customers	
	Billed Unmetered Consumption by Registered Customers					
Unbilled Authorised Consumption	Metered					
	Unmetered					
Water Losses	Apparent Losses		Unauthorised Consumption Customer Metering Under-registration			
	Real Losses	Leakage on Mains Leakage and Overflows at Service Reservoirs Leakage on Service Connections up to the street/property boundary				
Water Imported	(allow for bulk meter errors)					Non-Revenue Water

Infrastructure Leakage Index (ILI)

- Uses concept of 'Unavoidable Annual Real Losses' (UARL)
- Current Annual Real Losses (CARL)
- $ILI = \text{Ratio of CARL} / \text{UARL}$ (dimensionless)
- CARL is calculated using the water balance
- UARL is determined using a simple empirical formula

$$= (18 * L_m + 0.8 * N_s) * P$$

where L_m is the length of watermains in km, N_s is the number of service connections, and P is the average operating pressure at average zone point in metres

Infrastructure Leakage Index (ILI)

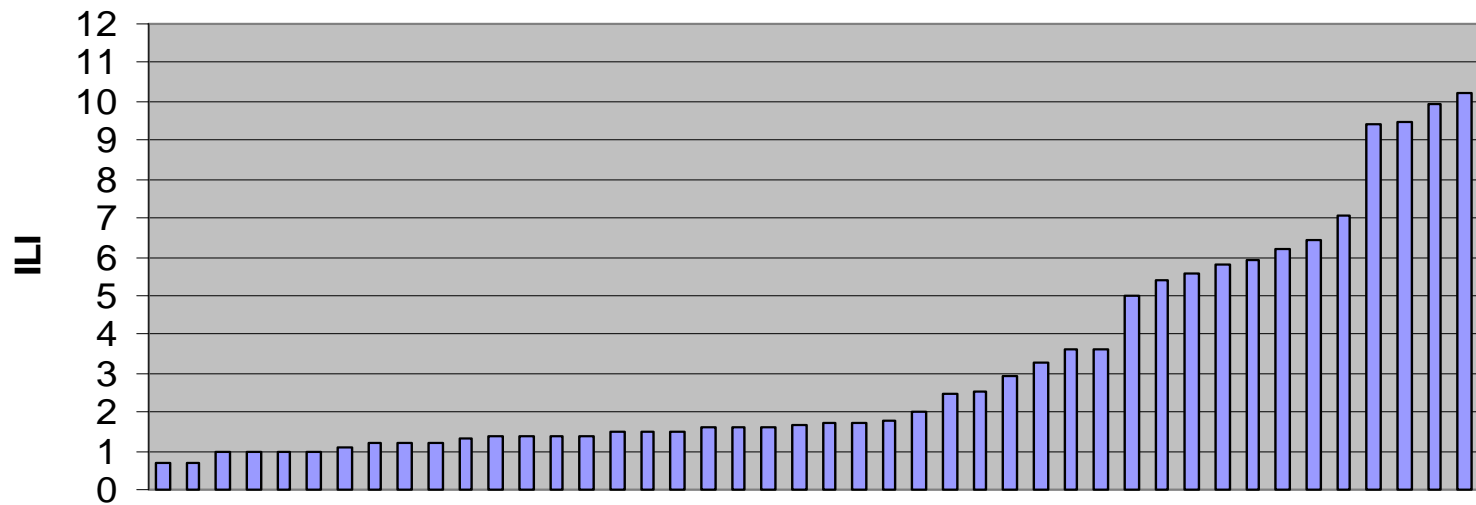
The Infrastructure Leakage Index represents the level of water loss from a supply system (excluding leakage from private water systems) while allowing for the supply pressure of the system.

The other main Performance Measure for real water losses for 'urban' systems is: Litres/connection/day

For rural/low density of connections: Litres/km/day

Note: Percentage water loss should **NOT** be used as it relates water losses to consumption

International Infrastructure Leakage Index (ILI) Results



New Zealand (5) Australian (17) and European (22) Cities

**Infrastructure
Leakage
Index ILI
= CARL/UARL**

**Pressure
Management**

**Current Annual Real Losses
CARL**

**Unavoidable
Annual Real
Losses**

**Speed and
Quality of
Repairs**

**Active
Leakage
Control**

**Pipeline and
Assets
Management:
Selection,
Installation,
Maintenance,
Renewal,
Replacement**

Four Key Factors influencing Water Losses in Distribution Systems

- Speed and Quality of Repairs
- Pressure Management
- Active Leakage Control
- Pipeline and Assets Management: Selection, Installation, Maintenance, Renewal, Replacement

Water Loss Initiatives undertaken in Waitakere City since 1990

- Setting up and Monitoring of Discrete Supply Areas
- Active Leakage Control
- Pressure Management

Also:

- Speed and Quality of Repairs
- Pipeline and Assets Management: Selection, Installation, Maintenance, Renewal, Replacement

Setting Up and Monitoring of Discrete Supply Areas

- Bulk water to Waitakere City is supplied through approximately 30 Watercare bulk supply points (BSP's)
- Telemetry system was used to monitor flows 'real time' using pulse units on existing Watercare bulk meters at BSP's
- Supply areas were set up in the early 1990's based on monitoring Watercare 'Bulk Supply Points (BSP's)'
- 17 main supply zones were set up in Establish 'benchmarks' for MNF for each zone – either based on number of properties and length of mains (UARL) or 'best achieved'

Setting Up and Monitoring of Discrete Supply Areas

- Telemetry system was used to monitor flows 'real time' using pulse units on existing Watercare meters at Bulk Supply Points (BSPs)
- Supply areas were set up in the early 1990's based on the location and supply pressure of the BSPs
- 17 main supply zones were initially set up. Now with pressure management, 34 discrete areas (District Metered Areas or DMAs) are monitored

Active Leakage Control

- Use real time monitoring of minimum night flows (MNF)
- Establish 'leakage thresholds' for MNF for each zone
- Target leak detection in supply zones with high MNF
- Reduced Leak Detection Programme costs – from \$250k to \$80k pa.
- Performance based leak detection contract
- Utilise new technologies eg noise loggers

Pressure Management

- **Approach**

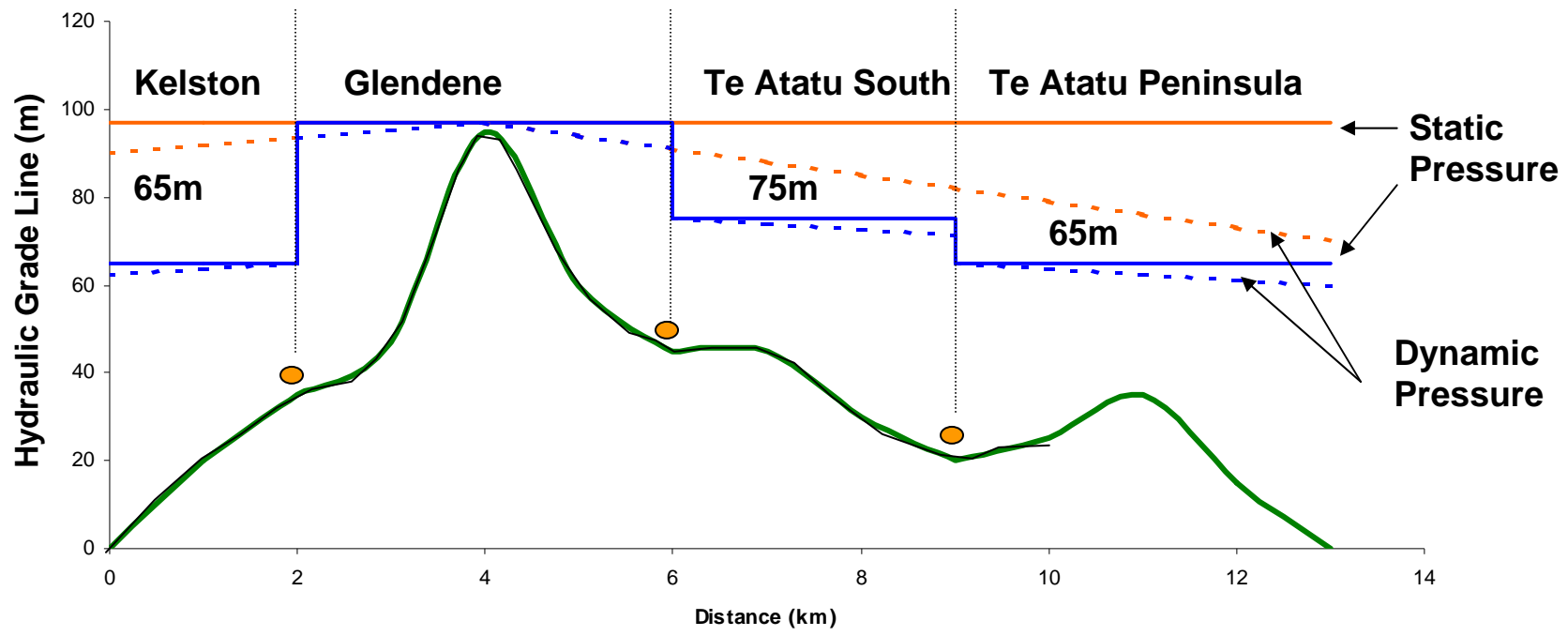
- Permanent system rezoning to reduce maximum pressures;
- Cascade approach - creating pressure zones according to topography;
- Created additional District Metered Areas with minor reticulation works;
- Used basic Pressure Reducing Valve - fixed outlet pressure option.

- **Criteria**

- Retain existing level of service: pressure 250 kPa & flow 25 l/min;
- Statutory requirements - NZ Fire Service Code of Practice; and
- Considered existing fire sprinkler requirements.

Example of Cascading – Zone 5 - Supply Point At Top Of Zone -

- Pressure Reducing Valve
- Without Pressure Management
- With Pressure Management



Pressure Reducing Valve Installation



Speed and Quality of Repairs

- High awareness of 'leaks' in Waitakere City
- Clay soils assist in identifying leaks
- Real time reporting for maintenance work

Asset Management System and Renewal Programme

- Asset information and system (Hansen AMS) used to identify mains requiring replacement
- Effective watermain renewal programme

**Infrastructure
Leakage
Index ILI
= CARL/UARL**

**Pressure
Management**

**Current Annual Real Losses
CARL**

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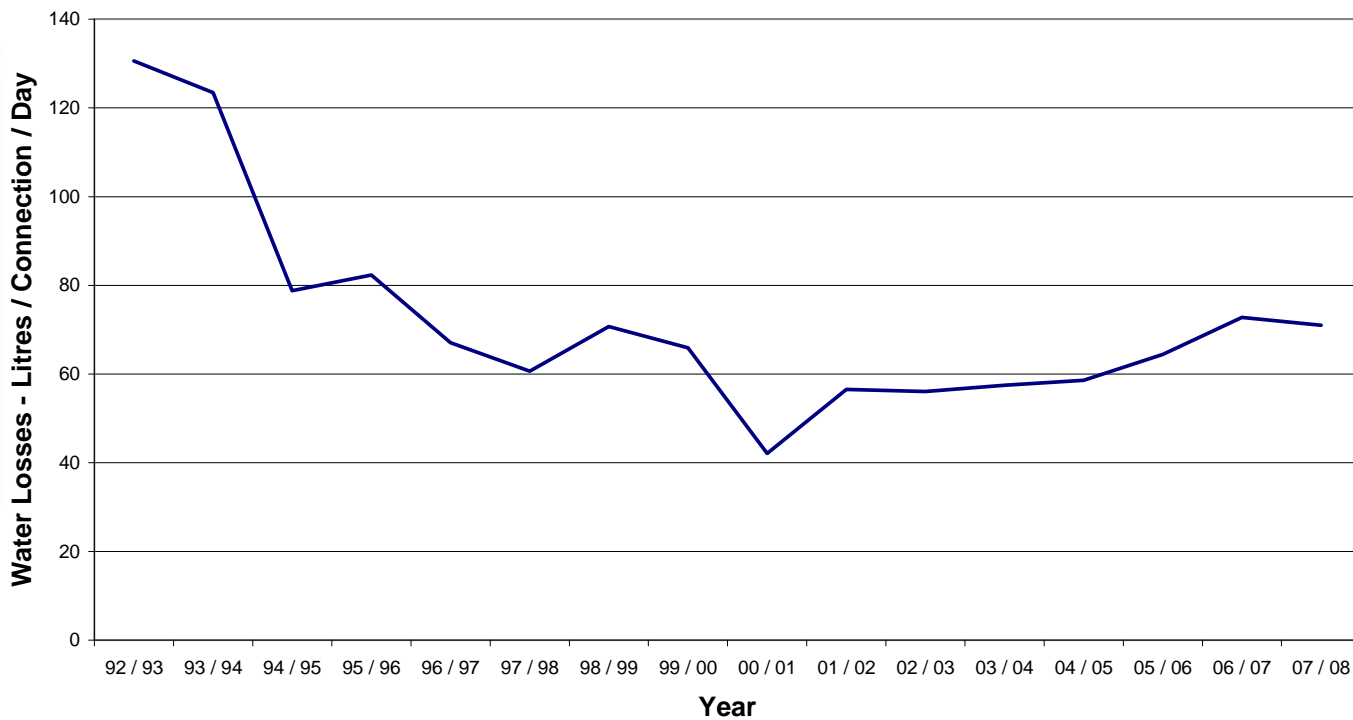
**Speed and
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Reduction in Real Water Losses in Waitakere City

Waitakere City - Level of Real Water Losses



Management Aspects

- **Culture for Change**

Eco City, Culture of promoting innovation and change

Council's Mission Statement – Open, Dynamic, Just

- **Catalyst for Change**

1993 Water Shortage

Allan Lambert's visit to Auckland in 2000

Management Aspects continued

- **Commitment to Change**

Commitment by dedicated staff over a long period
Support of management

- **Structure for Change**

Bulk/retail split & metering facilitated the monitoring programme
The 'size' of Waitakere's network and staffing levels encouraged innovation

Summary

- **The Infrastructure Leakage Index (ILI) is a very useful performance indicator for comparing water losses between water distribution systems.**
- **Waitakere City Council has been very successful in reducing water losses since 1990 by implementing a number of initiatives.**
- **Waitakere City has achieved and maintained an ILI of 1.0 which is considered to be a ‘world class’ standard.**

Thank you