

The Importance of Accurate Data in Outage Investigations Carried out by Wellington Electricity to Improve the Management of its Assets

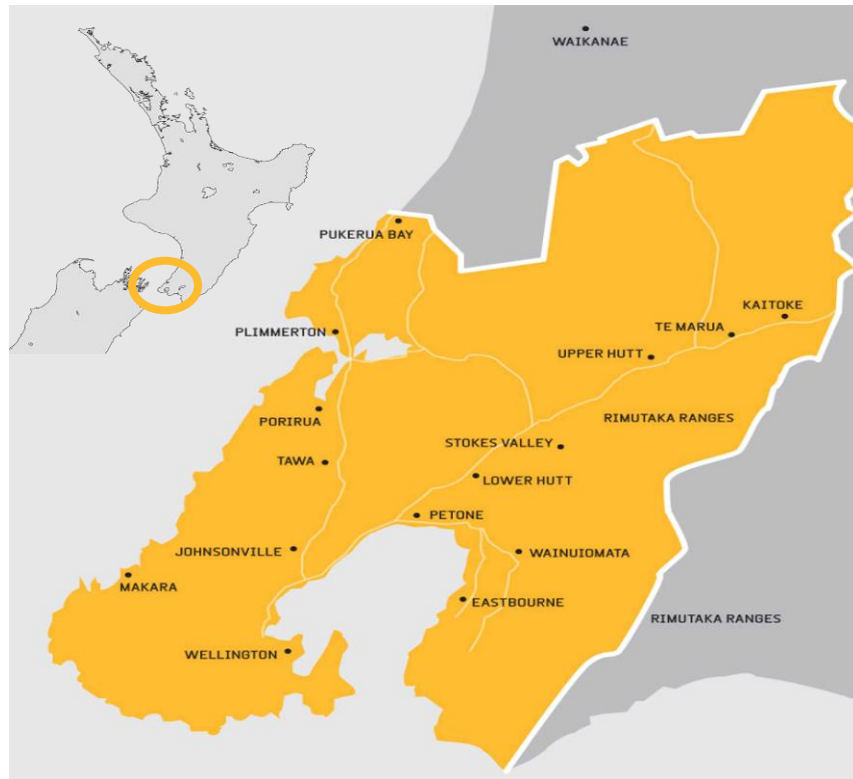


Rebecca Harkerss – Graduate Engineer

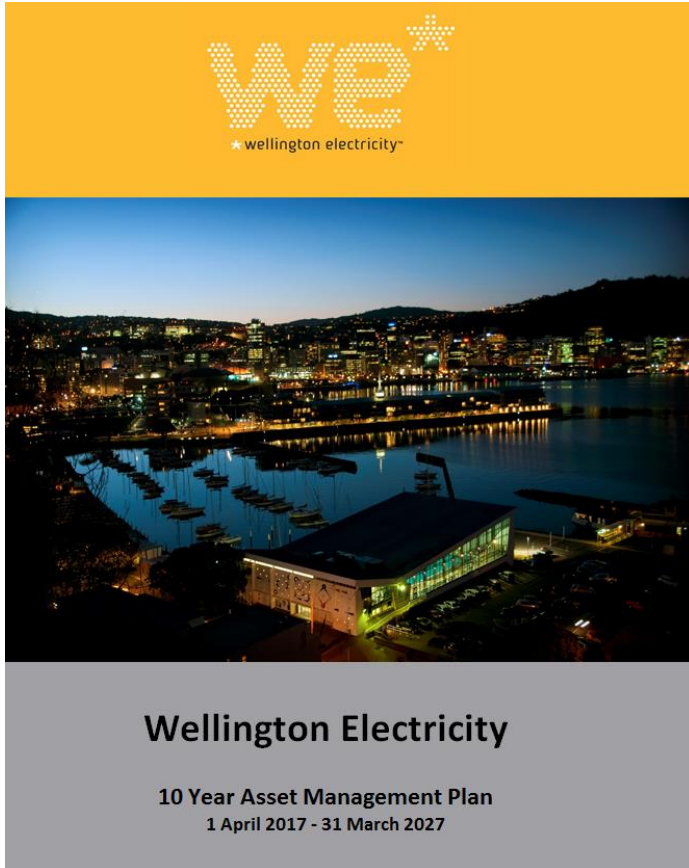
18th August 2017

- 1 Introduction – Wellington Electricity
- 2 Wellington Electricity's Mission
- 3 International Asset Management Practices
- 4 When WE* do an Outage Investigation
- 5 Process Followed
- 6 Examples

- Wellington Electricity Lines Limited
- Distribution lines company of the Wellington region
- New Zealand's 4th largest electricity distribution company
- Owned by CK Infrastructure and Power Assets Holdings Limited
 - Distribution networks in Australia, Hong Kong, New Zealand and the UK
- Supplies over 400,000 consumers connected through more than 167,000 ICPs

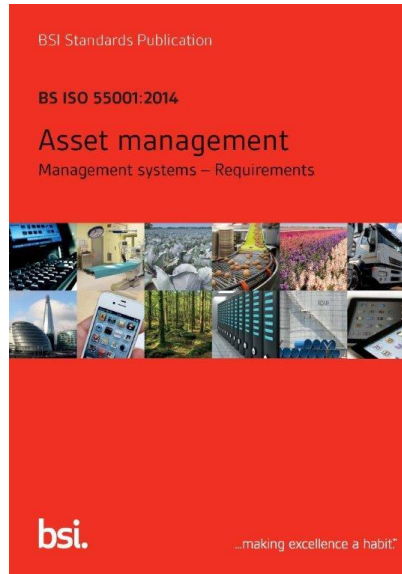


2 Wellington Electricity's Mission



“To own and operate a sustainably profitable electricity distribution business which provides a safe, reliable, cost effective and high quality delivery system to our customers.”

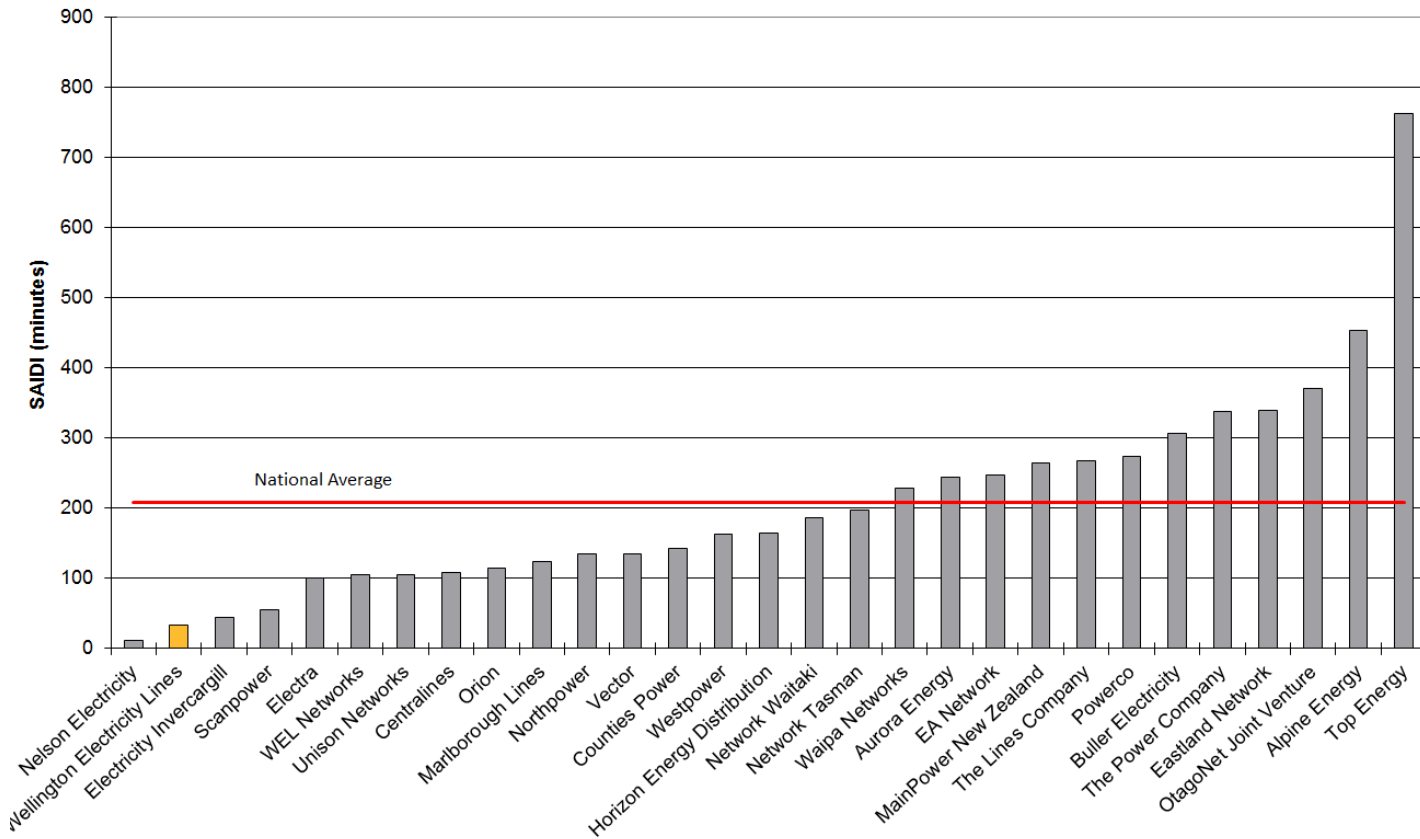
- ISO 55001:2014 – Asset Management – Management Systems – Requirements
 - Specifies the requirements for an organizations asset management system.
 - Section 10.1: Nonconformity and corrective action.



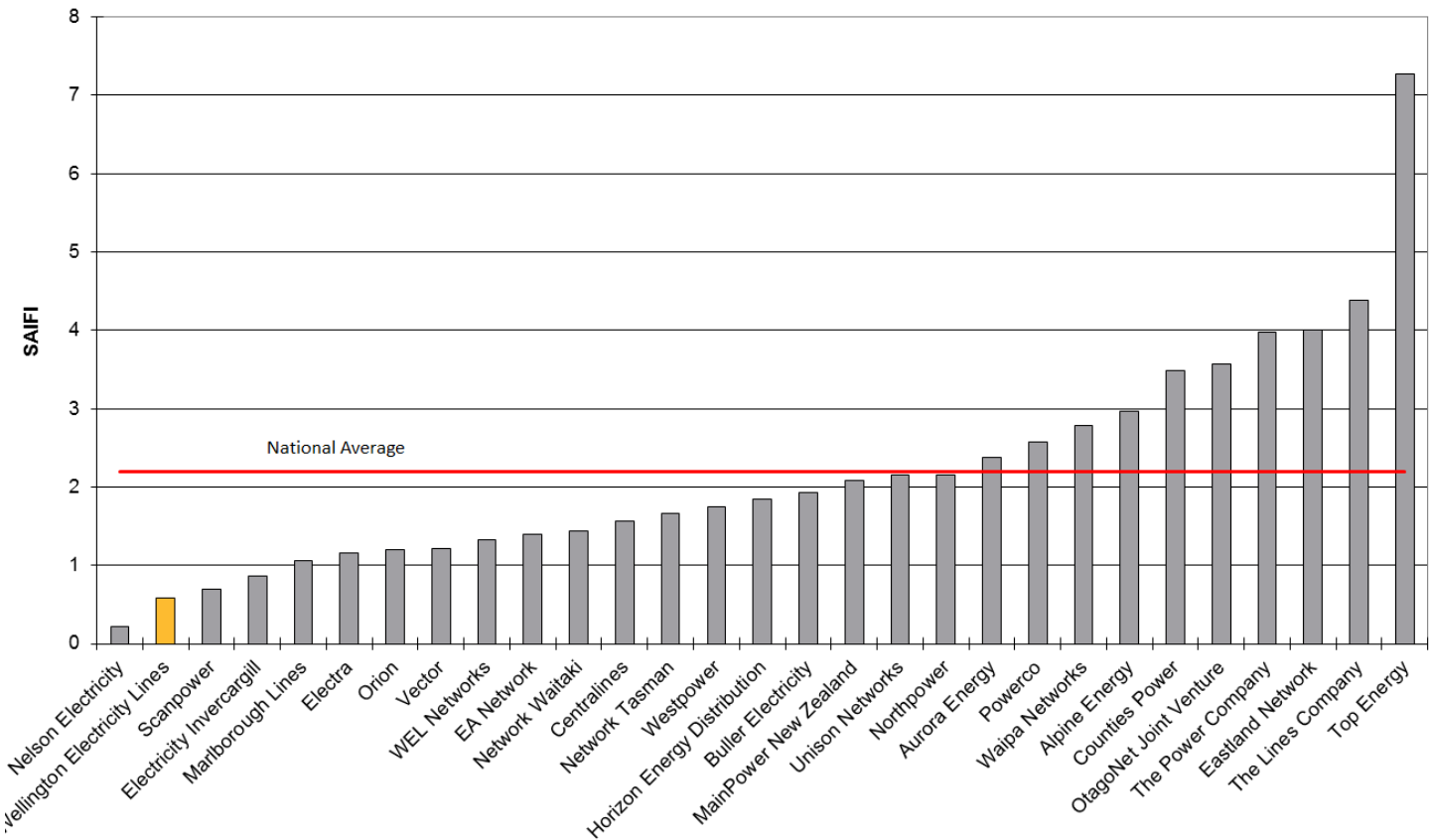
- Network Reliability:
 - SAIDI (System Average Interruption Duration Index)
the total time electricity supply is not available to the average consumer, and
 - SAIFI (System Average Interruption Frequency Index)
the total number of supply interruptions experienced by the average consumer
- Quality of supply

$$SAIDI = \frac{\text{No. customers affected} \times \text{max time off}}{\text{Total No. customers}}$$

$$SAIFI = \frac{\text{No. customers affected}}{\text{Total No. customers}}$$



4 When WE* do Outage Investigations



- Two types of Outage Investigations
 1. Outage Report
 - SAIDI >0.45 minutes, or
 - SAIFI >0.02
 2. Asset Failure Investigation Report
 - Critical asset failure, or
 - Asset failure repeating, or
 - SAIDI >0.45 minutes or SAIFI >0.02

5 Process Followed – Outage Report

1. Gather data

we*
wellington electricity™

FAULT REPORT

Job Name: **Plimmerton Z/S CB12 Tripped on Overcurrent & Earthfault**

Incident Number:	INCD-16679-S	Fault Number:	F-403-S
Date:	02/05/2017 19:34	Flag Sheet Sent:	Yes
Zone Substation:	Plimmerton	Protection Operated:	Overcurrent & Earthfault
Zone Feeder:	12	Telnet Notified:	19:34
Other:		Control Room Operator:	Glenn Samson
Time of Fault:	02/05/2017 19:32	F/Mans Full Name:	Adrian Whitehead / Micah Crawshaw
Time Faultman Onsite:	AW 20:10	Number of Customers:	287

Final Isolation Area : 250 AIRLIE Rd (East of Railway Bridge), ABS 778 20 COROGLLEN RISE(Blackridge Off Airlie Rd), ABS 639 37 ULRIC St (Opp Weigh Station), ABS 238 310 SH 1, ABS 65

District: Porirua

Substation Code: Plimmerton

Pole Number: 359068 Weather Conditions: fine

Street or Location: Airlie Road

Work Description: Replace 2 poles and repair 11kV lines

Comments: 19:32 Plimmerton Z/S CB12 Tripped on Overcurrent & Earthfault
19:36 AW reports on his way, sent to patrol lines from 214 St ANDREWS ROAD, C741 to 37 ULRIC St (Opp Weigh Station), ABS 238
19:43 Fire call report of lines down in Airlie Road. AW
19:45 AW re-directed to Airlie Rd
Karl Benton reports that two poles and transformer need to be replaced, he will fix the poles and lines but transformer probably to be done in daylight

Cause: Car vs Pole

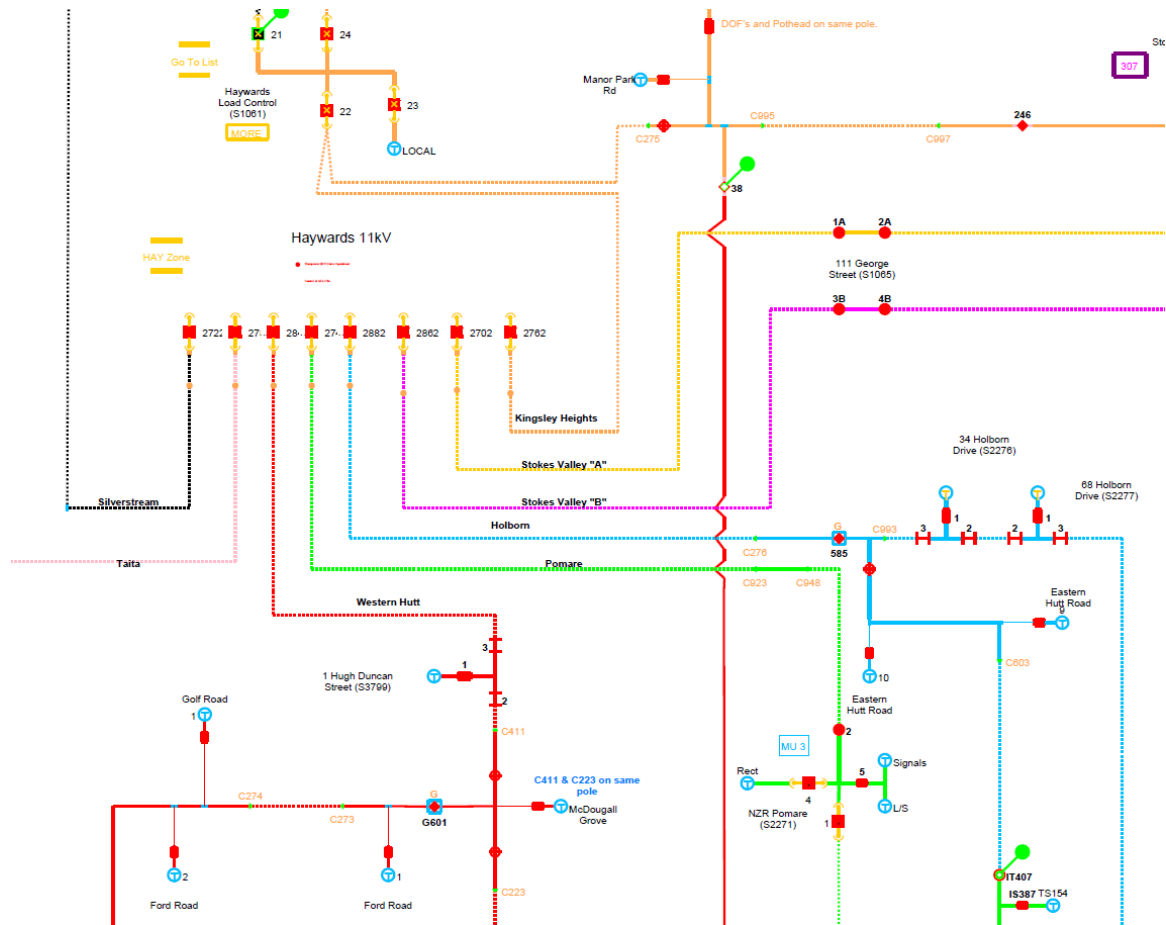
Created By: Glenn Samson Date/Time: 02/05/2017 19:34
Completed By: Richard Teo Date/Time: 03/05/2017 15:12

2. Analyse Reason for Prolonged Outage (High SAIDI or SAIFI)

- Did the faultman arrive within an acceptable time?
- Did it take a long time to find the fault?
- Was a permit required to carry out work?
- Was Traffic Management required?
- Was it on a State Highway?
- Were all possible back feeds put in place ASAP?
- Was the switching sequence appropriate?

3. Compile Report

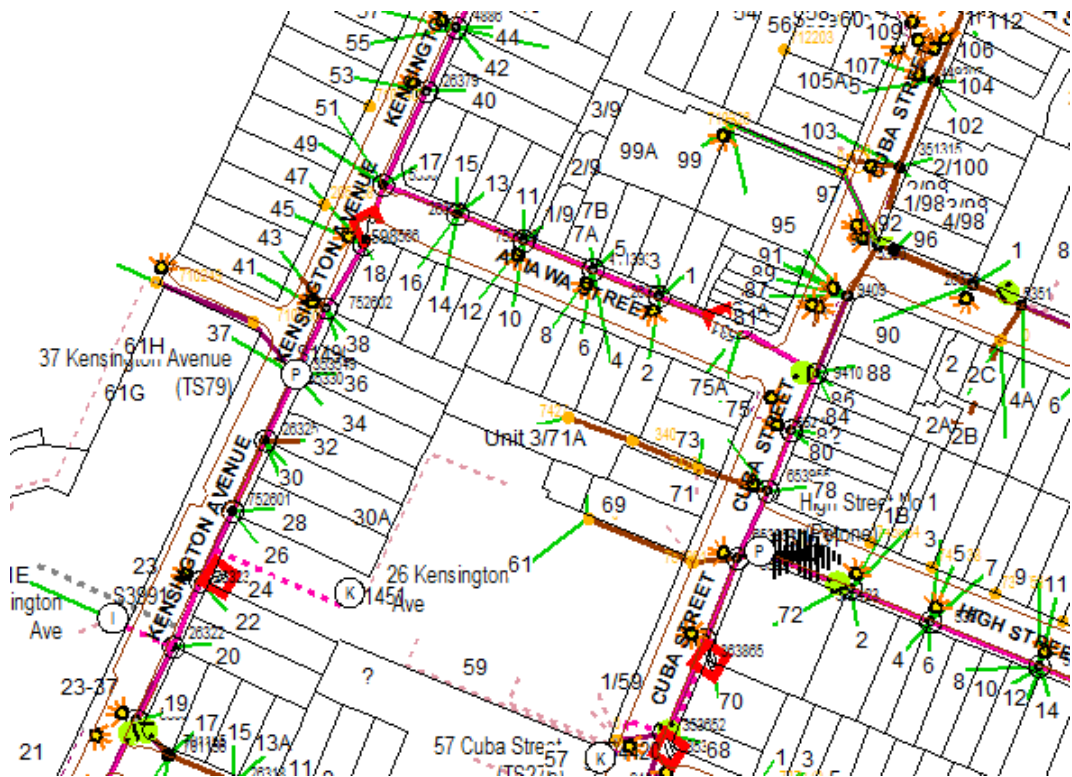
- Summarise Incident
- Sequence of Events
- Single Line Diagram (SLD)
- Findings
- Observations
- Recommendations
- Actions



4. Input Actions to Master file

INCD#	Feeder/Sub	Action	Name	Dept	Priority	Due Date
INCD-15958-S	Plimmerton 11	Look at long span of the 11kV conductor at the back of Plimmerton Zone Sub for possible installation of additional pole	Agnes Canita	Asset & Planning	Medium	22/12/2017

1. Gather data
2. Analyse **fault cause**
3. Compile Report
 - Summary of events
 - Single Line Diagram/Map
 - **Cause Analysis**
 - Findings
 - Recommendations
 - Actions
4. Input Actions to Master





FAULT REPORT

Job Name: **Porirua Zone CB9 tripped on Earth Fault**

Incident Number: **INCD-17680-S** Fault Number: **F-428-S**

Date: **30/05/2017 09:34** Flag Sheet Sent: **YES**

Zone Substation: **Porirua** Protection Operated: **Earth Fault**

Zone Feeder: **CB9** Telnet Notified: **09:32**

Other: _____ Control Room Operator: **Glenn Samson**

Time of Fault: **30/05/2017 09:30** F/Mans Full Name: **Micah Crawshaw**

Time Faultman Onsite: **10:00 MC 10:08 SB** Number of Customers: **1308**

Final Isolation Area : **Champion St Opp Windley St, ABS 376 205 CHAMPIDON STREET, ABS 721**

District: **Porirua**

Substation Code: **Porirua**

Pole Number: _____ Weather Conditions: **overcast**

Street or Location: **135 Champion St**

Work Description: _____

Comments: 09:30 Porirua Zone CB9 tripped on Earth Fault-----1308 Customers OFF

09:32 advise Telnet & NP dispatch

09:35 MC advise heading to Porirua Zone, directed to McKillop Street A

09:35 Police advise car v pole cnr Champion St and Hereford St

09:38 MC called, re-directed to cnr Champion St and Hereford St

10:00 2 poles confirm down, commenced isolation of faulted area

10:11 faulted area isolated, unfaulted area restored-----830 Customers ON

Permit Issued to disconnect jumpers Pole No. 10819 and make repairs to main line.

13:02 ABS 376 Closed -----341 customers ON

Permit Issue make repairs damaged poles

to reduce load so that A376 could be opened safely

18:20 Hereford St No 3 Dofs were opened - 65 customers off, 18:41 Gloucester St No 1 Dofs were opened - 57 customers off, and at 19:00 27A Cornwall Cres Dofs were opened - 100 Customers off

ABS 376 was opened - 119 customers off

Permit issued to reconnect Hereford St to the main line

While the work to reconnect hereford st was carried out all Dofs were closed and lv restored

At 20:26 ABS 376 was closed restoring 478 customers (341 + 137)

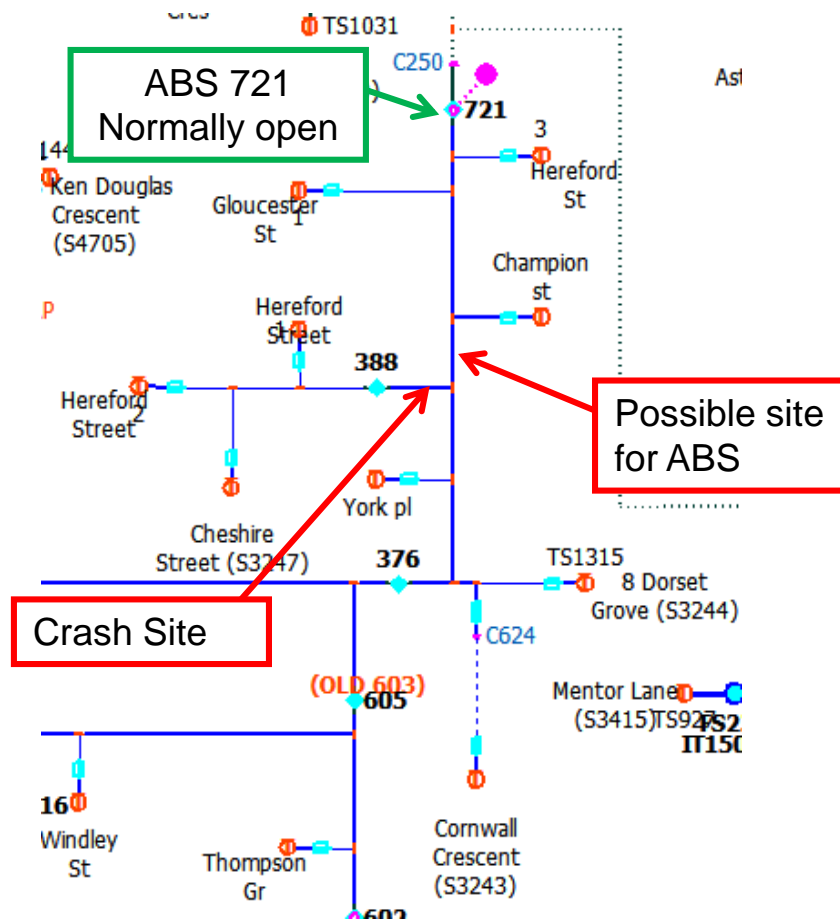
Cause: **Car V Pole**

- **Date and Time:** 30/05/2017 9:30 a.m.
- **Feeder:** Porirua CB9
- **# Customers affected:** 1308
- **Cause:** 2 Cars vs Poles



Recommendations:

- Investigate installing an air break switch (ABS) between the Hereford Street 'T-off' and the Champion Street substation.
- Redo LV link at Gloucester Street No 1 sub.





FAULT REPORT

Job Name: **Waitangirua CB8 tripped on E/F @ 02:17 19/05/2017. Black marks and burning smell on cable below Niagara Street Links 4 (At Ground Level).**

Incident Number:	INCD-17236-S	Fault Number:	F-420-S
Date:	19/05/2017 02:17	Flag Sheet Sent:	Yes
Zone Substation:	Waitangirua	Protection Operated:	Waitangirua CB8 tripped on E/F @ 02:17
Zone Feeder:	CBB	Telnet Notified:	Yes
Other:	Niagara Street Links 4	Control Room Operator:	Pat Hoy
Time of Fault:	19/05/2017 02:17	F/Mans Full Name:	Murray McQueen/Stu Robb
Time Faultman Onsite:	Murray 02:59	Number of Customers:	724

Final Isolation Area : **Cable between Niagara Street, Links 4 and 96 Waihora Crescent, ISOL IT813 (Niagara Street)**

District: **Porirua**

Substation Code: **Waitangirua**

Pole Number: **n/a** Weather Conditions: **Raining, windy**

Street or Location: **38 Niagara Street, Waitangirua**

Work Description: **Locate cable fault.**

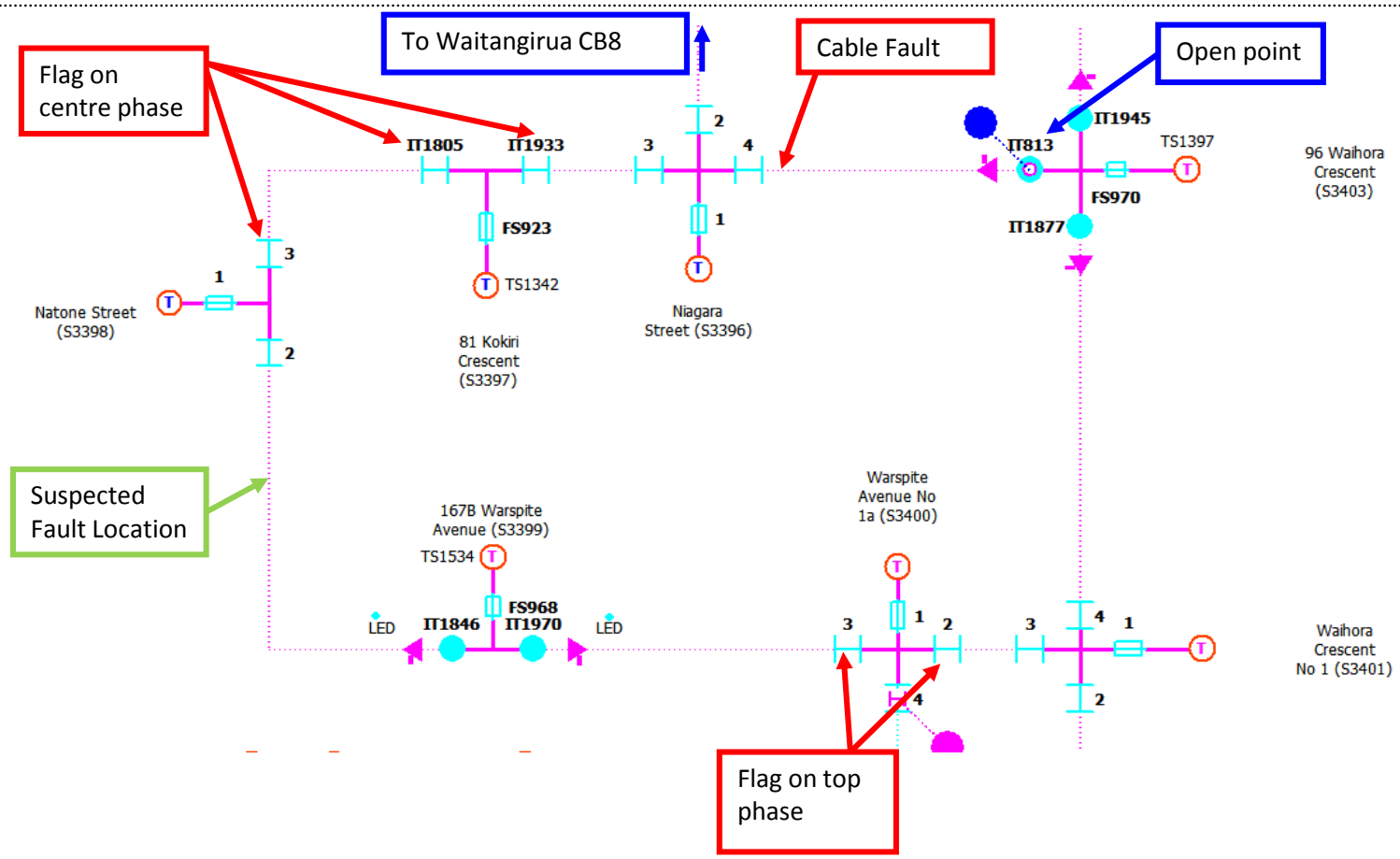
Comments: 0217 Waitangirua CB8 tripped on E/F.
 0235 Murray on way from home. Go to 167B Warspite Ave and check external LED's.
 0242 Stu Robb on way from home. ETA 1/2hr. Go to Waihora Cres No1. Check flags.(O/H to farm).
 0259 167B Warspite Ave. No LED's flashing. MM to Natone Street.
 0305 Natone Street Links 3 Flag on Centre phase MM go to 81 Kokiri Cres
 0312 81 Kokiri St Centre flags on IT1805 & IT1933.
 0314 Waihora Cres No1, CSS2 & DOP's at OK SR
 0327 Flags on top phase Links 2&3 at 1a Warspite Ave SR to 222 Warspite Ave and MM to 167B Warspite Ave.
 0338 SR check flags at 96 Waihora Cres.
 0340 Waitangirua CB8 tripped after isolating Natone Street to 167B Warspite Ave.
 0345 MM has found cable from links 4 at Niagara Street black marks and bad smell at ground level.
 0351 Closed Waitangirua CB8. --> 156 customers restored.
 0407 Closed 167B Warspite Ave ISOL IT1846. --> All customers restored.

Cause: **Cable fault cause to be determined.**

- **Date and Time:** 19/05/2017 2:17 a.m.
- **Feeder:** Waitangirua CB8
- **# Customers affected:** 724
- **Cause:** Cable Fault

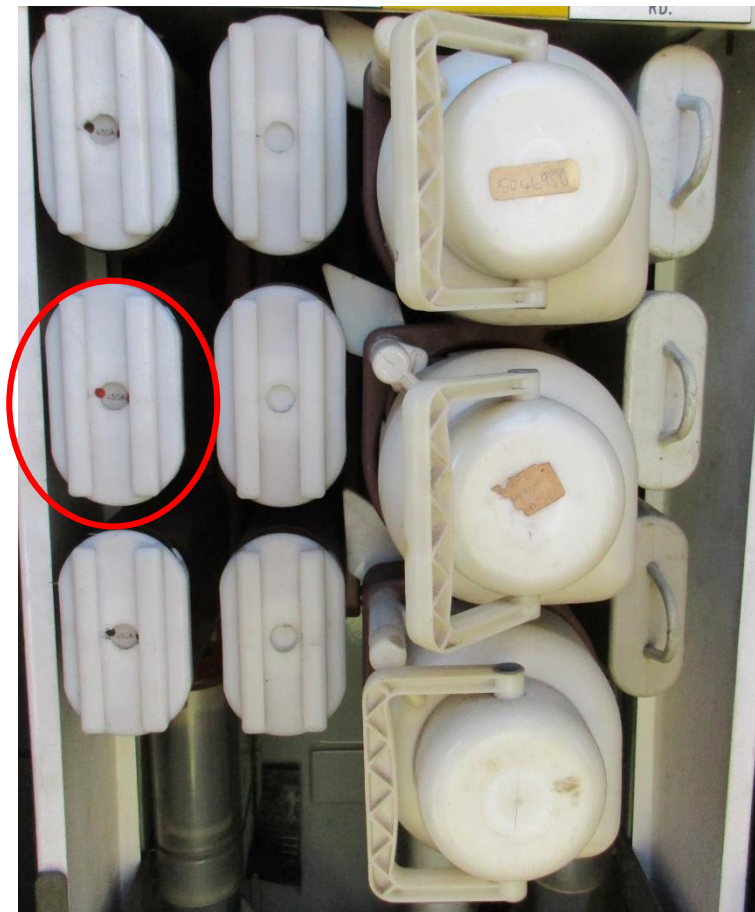


Example #2 – Waitangirua CB8 – 19th May 2017



Recommendations:

- Northpower will check Magnefix unit flags and reset them (where necessary) during the next annual inspection.
- Update standard for annual inspection to include checking and resetting flags.



Questions?