ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

SOUTH WAIRARAPA DISTRICT COUNCIL AND MERCURY ENERGY LIMITED

Prepared by: Tara Gannon

Date audit commenced: 17 March 2020

Date audit report completed: 14 May 2020

Audit report due date: 1 June 2020

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EXECUTIVE SUMMARY

This audit of the **South Wairarapa District Council (SWDC)** DUML database and processes was conducted at the request of **Mercury Energy Limited (Mercury)** in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1. The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information.

The SWDC DUML ICP switched to Mercury on 01/10/2019.

A RAMM database is maintained by Fulton Hogan. Power Services Wairarapa (PSW) complete all fieldwork for the SWDC streetlights, with assistance from Fulton Hogan as required. Additions, removals, and changes to lights are communicated to Fulton Hogan. The information is provided in a spreadsheet and manually keyed into RAMM. Not all lights can currently be recorded in RAMM, because it is not possible to load some lights close to the border of other regions, and some new subdivision lights.

Mercury reconciles the SWDC DUML load using the HHR profile in accordance with exemption 233. Wattages are derived from a RAMM database extract, which has been validated and updated by Dave Patten with corrections and changes since it was created in August 2019. On and off times are derived from a data logger.

Dave Patten is working with the SWDC to arrange for the missing and incorrect RAMM data identified before and during this audit to be updated, so that extracts can be provided directly from the database. It was hoped that this would be completed by the end of April 2020, but the COVID-19 lockdown has delayed this.

The accuracy of the database extract provided to Mercury was assessed:

Result	Percentage	Comments
The point estimate of R	103.4	Wattage from the survey is higher than the database wattage by 3.4%
R_L	91.9	With a 95% level of confidence it can be concluded that the error could be between -8.1% and +36.8%
R_H	136.8	

The results indicate that the best available estimate is not precise enough to conclude that the database is accurate within ±5%. Most streets had little, if any, difference in wattage. The variability of the sample results was impacted by larger wattage differences for SH53 Revans St, Featherston (470W) and SH53 Kitchener St, Martinborough (112W), which significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 8.1% lower and 36.8% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 2 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 4 kW and 18 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 7,100 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 16,700 kWh lower and 76,100 kWh higher than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed, and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot, which is non-compliant. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of 16 indicates that the next audit be completed in six months. SWDC was provided a list of all discrepancies identified during the audit, and has updated the database extract and is working to update RAMM. I recommend that the next audit is completed in a minimum of 12 months to allow time for the issues to be investigated and resolved in RAMM.

The matters raised are detailed below:

AUDIT SUMMARY

NON-COMPLIANCES

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Deriving submission information	2.1	11(1) of Schedule 15.3	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Changes are not always recorded in the database extract from the date which they became effective.	Moderate	Medium	4	Identified
Location of each item of load	2.3	11(2B) of Schedule 15.3	20 items of load do not have sufficient location information recorded to enable them to be readily located.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B (b)	The database is not confirmed as accurate with a 95% level of confidence. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. 20 items of load do not have sufficient location information recorded to enable them to be readily located. Two items of load had correct GPS coordinates, but incorrectly recorded street addresses. • A light situated at the end of Westwood Lane, Greytown was recorded against Kuratawhiti St, Greytown. • A light outside 17 Homestead Lane, Greytown was recorded against Udy Street, Greytown. 95 items of load had transposed GPS coordinates, with the northing value recorded in the easting field and vice versa. Dave Patten confirmed he will	Moderate	Medium	4	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			arrange for the GPS coordinates to be updated.				
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Changes are not always recorded in the database extract from the date which they became effective.	Moderate	Medium	4	Identified
Future Risk Rating						16	

Future risk rating	0	1-4	5-8	9-15	16-18	19+
Indicative audit frequency	36 months	24 months	18 months	12 months	6 months	3 months

RECOMMENDATIONS

Subject	Section	Recommendation
		Nil

ISSUES

Subject	Section	Description	Issue
		Nil	

1. ADMINISTRATIVE

1.1. Exemptions from Obligations to Comply with Code

Code reference

Section 11 of Electricity Industry Act 2010.

Code related audit information

Section 11 of the Electricity Industry Act provides for the Electricity Authority to exempt any participant from compliance with all or any of the clauses.

Audit observation

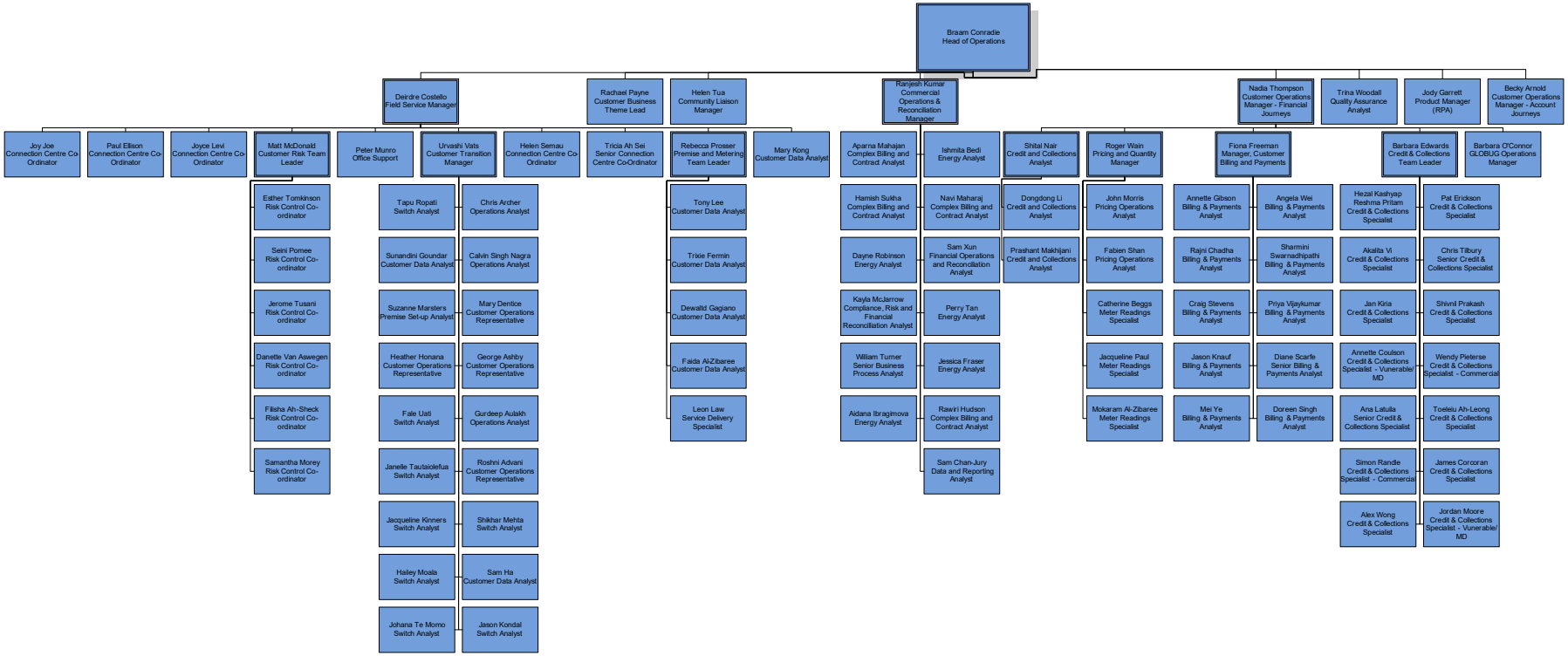
Current code exemptions were reviewed on the Electricity Authority website.

Audit commentary

Mercury has been granted exemption No. 233. This allows them to provide half-hour ("HHR") submission information instead of non half-hour ("NHH") submission information for distributed unmetered load ("DUML"). This exemption expires on 31 October 2023.

1.2. Structure of Organisation

Mercury provided their current organisational structure:



1.3. Persons involved in this audit

Auditor:

Tara Gannon

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Dave Patten	Project Manager	Sole Trader
Tim Langley	Roading Manager	South Wairarapa District Council
Kayla McJarrow	Compliance, Risk & Financial Reconciliation Analyst	Mercury Energy

1.4. Hardware and Software

RAMM

The SQL database used for the management of DUML is remotely hosted by RAMM Software Ltd. The database is commonly known as "RAMM" which stands for "Roading Asset and Maintenance Management". The specific module used for DUML is called RAMM Contractor.

RAMM Software Limited backs up the database and assists with disaster recovery as part of their hosting service. Nightly backups are performed. As a minimum, daily backups are retained for the previous five working days, weekly backups are retained for the previous four weeks, and monthly backups are retained for the previous six months.

Access to the database is secure by way of password protection.

Trader systems

Systems used by Mercury to calculate submissions are assessed as part of their reconciliation participant audit.

1.5. Breaches or Breach Allegations

There are no breach allegations relevant to the scope of this audit.

1.6. ICP Data

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0020906000WRDFA	STREET LIGHTING FEATHERSTON	GYT0331	HHR	964	48,388
Total				**964**	**48,388**

1.7. Authorisation Received

All information was provided directly by Mercury, SWDC or Dave Patten.

1.8. Scope of Audit

This audit of the SWDC DUML database and processes was conducted at the request of Mercury in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied. The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

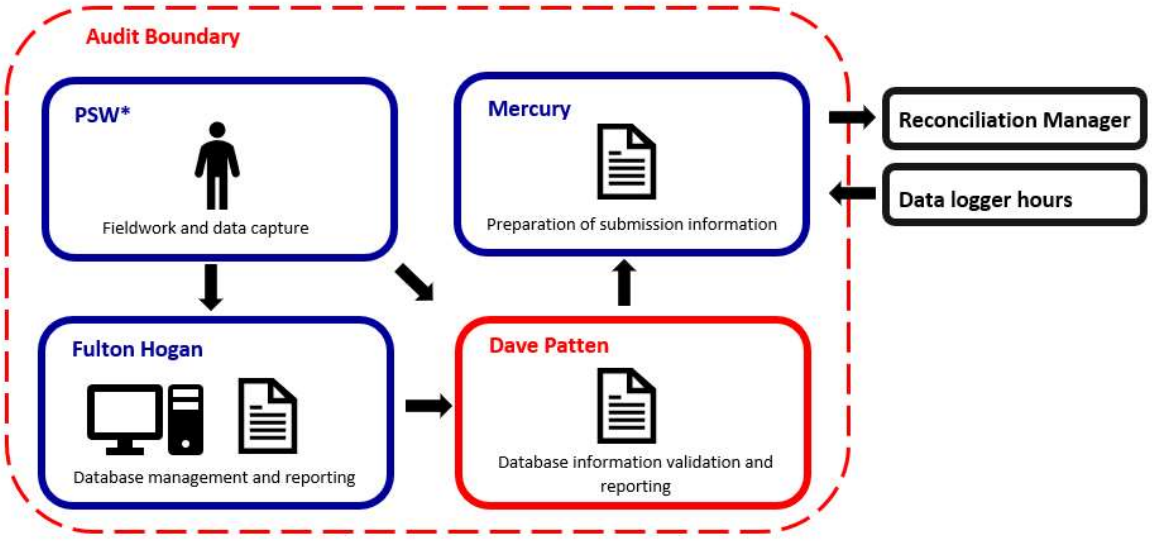
The SWDC DUML ICP switched to Mercury on 01/10/2019.

A RAMM database is maintained by Fulton Hogan. PSW complete all fieldwork for the SWDC streetlights, with assistance from Fulton Hogan as required. Additions, removals, and changes to lights are communicated to Fulton Hogan. The information is provided in a spreadsheet and manually keyed into RAMM. Not all lights can currently be recorded in RAMM, because it is not possible to load some lights close to the border of other regions, and some new subdivision lights.

Mercury reconciles the SWDC DUML load using the HHR profile in accordance with exemption 233. Wattages are derived from a RAMM database extract, which has been validated and updated by Dave Patten with corrections and changes since it was created in August 2019. On and off times are derived from a data logger.

Dave Patten is working with the SWDC to arrange for the missing and incorrect RAMM data identified before and during this audit to be updated, so that extracts can be provided directly from the database. It was hoped that this would be completed by the end of April 2020, but the COVID-19 lockdown has delayed this.

The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information based on the database reporting. The diagram below shows the audit boundaries for clarity.



The field audit was undertaken of a statistical sample of 162 items of load on 17 March 2020.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Tara Gannon of Veritek Limited in September 2017. The summary table below shows the statuses of the non-compliances raised in the previous audit. Further comment is made in the relevant sections of this report.

Subject	Section	Clause	Non-compliance	Status
Profiles	2.1	11(1) of Schedule 15.3	An incorrect profile is recorded on the registry for ICP 0020906000WRDFA.	Cleared. The correct profile is now recorded on the registry.
ICP number	2.2	11(2)(a) of Schedule 15.3	Two items of load do not have an ICP recorded.	Cleared.
Wattages	2.4	11(2)(c) & (d) of Schedule 15.3	Eight lamps have incorrect lamp wattage, and missing gear wattage.	Cleared for missing and invalid zero wattages. Still existing for incorrect lamp wattages.
All load recorded in database	2.5	11(2A) of Schedule 15.3	One lamp was missing from the database, and one lamp had an incorrect wattage recorded.	Cleared.
Database accuracy	3.1	Clause 15.2 & 15.37(b)	One lamp was missing from the database, and nine lamps had incorrect wattages recorded.	Still existing.

1.10. Distributed unmetered load audits (Clause 16A.26 and 17.295F)

Code reference

Clause 16A.26 and 17.295F

Code related audit information

Retailers must ensure that DUML database audits are completed:

1. *by 1 June 2018 (for DUML that existed prior to 1 June 2017)*
2. *within three months of submission to the reconciliation manager (for new DUML)*
3. *within the timeframe specified by the Authority for DUML that has been audited since 1 June 2017.*

Audit observation

Mercury have requested Veritek to undertake this streetlight audit.

Audit commentary

This audit report confirms that the requirement to conduct an audit has been met for this database within the required timeframe.

Audit outcome

Compliant

2. DUML DATABASE REQUIREMENTS

2.1. Deriving submission information (Clause 11(1) of Schedule 15.3)

Code reference

Clause 11(1) of Schedule 15.3

Code related audit information

The retailer must ensure the:

- *DUML database is up to date*
- *methodology for deriving submission information complies with Schedule 15.5.*

Audit observation

The process for calculation of consumption was examined and the application of profiles was checked. The database was checked for accuracy.

Audit commentary

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233.

- Wattages are derived from an extract provided by Dave Patten each month. The field survey found that the best available estimate of field wattage is not precise enough to conclude that the database is accurate within ±5.0% as recorded in **section 3.1**. Most streets had little, if any, difference in wattage. The variability of the sample results was impacted by larger wattage differences for SH53 Revans St, Featherston (470W) and SH53 Kitchener St, Martinborough (112W), which significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold.
- On and off times are derived from a data logger.

I reviewed the submission information for the February 2020 initial and revision one submissions and confirmed that the calculation methodology was correct, and that wattages were based on the extract and on hours were based on data logger information.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
15 lamps had incorrect total wattages. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1.	Potential over submission of 730 kWh p.a.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant, and Mercury completes revision submissions where corrections are required. Mercury has not yet updated their processes to be consistent with the Authority's memo.

The RAMM database contains a "light install date" and a "lamp install date" but there is not a field for "livening date" for newly connected lights. When changes are processed in the database extract used for submission they are applied from the first day of the month, rather than the date that the change took effect.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-Feb-20 To: 29-Feb-20	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Changes are not always recorded in the database extract from the date which they became effective. Potential impact: Medium Actual impact: Unknown Audit history: Once Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate. SWDC is aware of the issues preventing all lights from being recorded in RAMM, and ensures that the extracts are validated and corrected as necessary before being provided to Mercury. When discrepancies were identified during the audit they were promptly investigated and updated information was provided to Mercury, which was used to produce revision submissions. The potential impact could be medium because the database could not be confirmed to be accurate with 95% confidence.

Actions taken to resolve the issue	Completion date	Remedial action status
We will continue to work with SWDC when discrepancies are identified to ensure timely correction. We will also work with SWDC to have the database reflect changes on a daily basis to ensure accurate consumption reporting.	Sep 20	Identified

Preventative actions taken to ensure no further issues will occur	Completion date	
We will continue to work with SWDC when discrepancies are identified to ensure timely correction. We will also work with SWDC to have the database reflect changes on a daily basis to ensure accurate consumption reporting.	Sep 20	

2.2. ICP identifier and items of load (Clause 11(2)(a) and (aa) of Schedule 15.3)

Code reference

Clause 11(2)(a) and (aa) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *each ICP identifier for which the retailer is responsible for the DUML*
- *the items of load associated with the ICP identifier.*

Audit observation

The database was checked to confirm the correct ICP was recorded against each item of load.

Audit commentary

All items of load have ICP 0020906000WRDFA recorded.

Audit outcome

Compliant

2.3. Location of each item of load (Clause 11(2)(b) of Schedule 15.3)

Code reference

Clause 11(2)(b) of Schedule 15.3

Code related audit information

The DUML database must contain the location of each DUML item.

Audit observation

The database was checked to confirm the location is recorded for all items of load.

Audit commentary

The database contains fields for the road name, displacement, pole number, and GPS coordinates.

944 items of load (98%) are locatable. 20 items of load have a road name, but displacement, pole number and GPS coordinates are not recorded in the database. All the affected lights are in new subdivisions and have been manually added into the database extract since they were connected. Once the new streets are vested in council, the location information will be updated and recorded in RAMM.

Carriageway Area	Road Name	Count of items of load
FEATHERSTON	ATAAHA CRES	5
GREYTOWN	HEWSON LN	3
GREYTOWN	ORCHARD RD	3
GREYTOWN	TARARUA RD	9

The accuracy of the recorded address information is discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.3 With: Clause 11(2)(b) of Schedule 15.3 From: unknown To: 05-Feb-20	20 items of load do not have sufficient location information recorded to enable them to be readily located. Potential impact: Medium Actual impact: Unknown Audit history: None Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as moderate. The correct location addresses including GPS coordinated will be updated once the lights are vested in council. The impact is assessed to be low. The 20 lights are affected are all situated in recently connected new subdivisions. The street addresses are recorded, and all lights within each street have the same lamp type.

Actions taken to resolve the issue	Completion date	Remedial action status
The database will be updated as explained above.		Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The database will be updated as explained above.		

2.4. Description and capacity of load (Clause 11(2)(c) and (d) of Schedule 15.3)

Code reference

Clause 11(2)(c) and (d) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *a description of load type for each item of load and any assumptions regarding the capacity*
- *the capacity of each item in watts.*

Audit observation

The database was checked to confirm that:

- it contained a field for light type and wattage capacity,
- wattage capacities include any ballast or gear wattage, and
- each item of load has a light type, light wattage, and gear wattage recorded.

Audit commentary

A description of each light is recorded in the lamp model field, and wattages are recorded in the lamp wattage and gear wattage fields. All items of load have a lamp model, and wattages recorded in the lamp and gear wattage fields.

No invalid zero lamp or gear wattages were identified. SWDC confirmed that their 26W fluorescent lights are self-ballasted, and the zero gear wattages recorded for the 14 lamps of this type is correct.

The accuracy of the recorded wattages is discussed in **section 3.1**.

Audit outcome

Compliant

2.5. All load recorded in database (Clause 11(2A) of Schedule 15.3)

Code reference

Clause 11(2A) of Schedule 15.3

Code related audit information

The retailer must ensure that each item of DUML for which it is responsible is recorded in this database.

Audit observation

The field audit was undertaken of a statistical sample of 162 items of load on 17 March 2020. The sample was selected from three strata, as follows:

1. NZTA and other,
2. Roading street names A-M, and
3. Roading street names N-Z.

Audit commentary

The field audit discrepancies are detailed in the table below:

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
NZTA and other					
DUBLIN ST WEST, MARTINBOROUGH	2	1	-1	-	One 70W SON at the Top 10 Holiday Park was not located in the field. The pole near the reception building did not have a light attached.
KURATAWHITI ST, GREYTOWN	6	5	-1	1	One L28 light in the Greytown camp ground was recorded as 70W SON, and one 70W SON light in the Greytown camp ground was a duplicate and was not located in the field.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
Roading street names A-M					
JELLICOE ST (MARTINBOROUGH), MARTINBOROUGH	20	20	-	2	Two L60,5A were recorded in the database with 55W instead of 51W.
KANSAS ST (NORTHERN LEG), MARTINBOROUGH	2	2	-	1	One L60,5A was recorded in the database with 55W instead of 51W.
KURATAWHITI ST, GREYTOWN	16	15	-	1	One L28 light in the Greytown camp ground was recorded as 70W SON.
MCKERROW PL, FEATHERSTON	2	1	-1	-	One 70W SON recorded in the database was not located on the street.
Roading street names A-M					
SH53 KITCHENER ST (M), MARTINBOROUGH	11	11	-	2	Two sodium lights were recorded in the database as 27W LED.
SH53 REVANS ST (F), FEATHERSTON	6	6	-	5	Five sodium lights were recorded in the database as 27W LED.
UDY ST, GREYTOWN	9	9	-	1	One L28 by the letterbox of 17 Homestead Lane was recorded as 27W LED in the database.
UNDERHILL RD (EXTENSION @ WAKEFIELD, FEATHERSTON	11	11	-	1	One L23 opposite 71 Underhill Rd was recorded as a 27W LED in the database.
WAITE ST, FEATHERSTON	6	6	-	1	One L23 at the corner of Waite St and Hardie Gr was recorded as a 27W LED in the database.
Grand Total	**162**	**159**	**-3**	**15**	

The field audit did not find any items of load missing from the database. The wattage differences identified during the field audit are recorded as non-compliance in **section 3.1**.

Dave Patten confirmed that the discrepancies were checked and corrections were made in the database extract by 01/04/20. Corrections will also be made in the RAMM database, but have been delayed by the COVID-19 lockdown.

Audit outcome

Compliant

2.6. Tracking of load changes (Clause 11(3) of Schedule 15.3)

Code reference

Clause 11(3) of Schedule 15.3

Code related audit information

The DUML database must track additions and removals in a manner that allows the total load (in kW) to be retrospectively derived for any given day.

Audit observation

The process for tracking of changes in the database was examined.

Audit commentary

The RAMM database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Mercury is detailed in **sections 3.1** and **3.2**.

Audit outcome

Compliant

2.7. Audit trail (Clause 11(4) of Schedule 15.3)

Code reference

Clause 11(4) of Schedule 15.3

Code related audit information

The DUML database must incorporate an audit trail of all additions and changes that identify:

- *the before and after values for changes*
- *the date and time of the change or addition*
- *the person who made the addition or change to the database.*

Audit observation

The database was checked for audit trails.

Audit commentary

The RAMM database has a complete audit trail.

A RAMM database extract was provided to Dave Patten in August 2019, which has been validated and updated to correct data discrepancies and add missing lights. A copy of this extract is provided to Mercury each month. Dave records an audit trail on the summary sheet of the spreadsheet showing the date of the change, and a description of the change made. The user who made the change is not specified, but these changes are consistently made by Dave Patten.

Compliance is recorded in this section, because the clause assesses database audit trails, and they are compliant.

Audit outcome

Compliant

3. ACCURACY OF DUML DATABASE

3.1. Database accuracy (Clause 15.2 and 15.37B(b))

Code reference

Clause 15.2 and 15.37B(b)

Code related audit information

Audit must verify that the information recorded in the retailer's DUML database is complete and accurate.

Audit observation

Mercury's submissions are based on a database extract, which had been validated and updated by Dave Patten with corrections and changes since it was created in August 2019.

A database extract was provided in February 2020 and I assessed the accuracy of this by using the DUML Statistical Sampling Guideline. The table below shows the survey plan.

Plan Item	Comments
Area of interest	South Wairarapa DC streetlights
Strata	The database contains 750 items of load in the South Wairarapa DC region. The management process is the same for all lights. I created three strata: 4. NZTA and other, 5. Roading street names A-M, and 6. Roading street names N-Z.
Area units	I created a pivot table of the roads and I used a random number generator in a spreadsheet to select a total of 22 sub-units.
Total items of load	162 items of load were checked, making up 15.6% of the database.

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority against the database or in the case of LED lights against the LED light specification.

The change management process and timeliness of database updates was evaluated.

Audit commentary

Field audit findings

A field audit was conducted of a statistical sample of 162 items of load. The "database auditing tool" was used to analyse the results, which are shown in the table below.

Result	Percentage	Comments
The point estimate of R	103.4	Wattage from the survey is higher than the database wattage by 3.4%
R_L	91.9	With a 95% level of confidence it can be concluded that the error could be between -8.1% and +36.8%
R_H	136.8	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The table below shows that Scenario C (detailed below)

applies, and the best available estimate is not precise enough to conclude that the database is accurate within ±5%. Most streets had little if any difference in wattage. The variability of the sample results was impacted by larger wattage differences for SH53 Revans St, Featherston (470W) and SH53 Kitchener St, Martinborough (112W), which significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 8.1% lower and 36.8% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 2 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 4 kW and 18 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 7,100 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 16,700 kWh lower and 76,100 kWh higher than the database indicates.

Dave Patten confirmed that the discrepancies were checked and corrections were made in the database extract by 01/04/20. Corrections will also be made in the RAMM database.

Scenario	**Description**
A - **Good accuracy, good precision**	This scenario applies if: (a) R_H is less than 1.05; and (b) R_L is greater than 0.95 The conclusion from this scenario is that: (a) the best available estimate indicates that the database is accurate within +/- 5 %; and (b) this is the best outcome.
B - **Poor accuracy, demonstrated with statistical significance**	This scenario applies if: (a) the point estimate of R is less than 0.95 or greater than 1.05 (b) as a result, either R_L is less than 0.95 or R_H is greater than 1.05. There is evidence to support this finding. In statistical terms, the inaccuracy is statistically significant at the 95% level
C - **Poor precision**	This scenario applies if: (a) the point estimate of R is between 0.95 and 1.05 (b) R_L is less than 0.95 and/or R_H is greater than 1.05 The conclusion from this scenario is that the best available estimate is not precise enough to conclude that the database is accurate within +/- 5 %

Light description and capacity accuracy

As discussed in **section 2.4**, all items of load have a lamp model, and wattages recorded in the lamp and gear wattage fields. There are no invalid zero lamp or gear wattages.

Lamp and gear wattages for all other lamps were compared to the expected values, and the following exceptions were identified:

Model	Database lamp wattage	Correct lamp wattage	Quantity	Total wattage difference
ITALO 1 STU	100	58	3	-126
ITALO 1 STU-S 4.7-3M	61	58	3	-9
Itron Zero 0C6 STA	55	51	9	-36
		Total	**15**	**-171**

These differences could result in an estimated annual over submission of 730 kWh. I confirmed that wattage corrections had been made for the 15 lights in the updated database extract provided to Mercury for February 2020 revision 1.

ICP number accuracy

All DUML load is connected to ICP 0020906000WRDFA, and all items of load have an ICP number recorded.

Address location accuracy

As discussed in **section 2.3**, 20 items of load have a road name, but displacement, pole number and GPS coordinates are not recorded in the database.

95 items of load had transposed GPS coordinates, with the northing value recorded in the easting field and vice versa. Dave Patten confirmed he will arrange for the GPS coordinates to be updated.

Two items of load had correct GPS coordinates, but incorrectly recorded street addresses:

- a light situated at the end of Westwood Lane, Greytown was recorded against Kuratawhiti St, Greytown, and
- a light outside 17 Homestead Lane, Greytown was recorded against Udy Street, Greytown.

Change management process findings

A RAMM database is maintained by Fulton Hogan. PSW complete all fieldwork for the SWDC street lights, with assistance from Fulton Hogan as required. Additions, removals, and changes to lights are communicated to Fulton Hogan. The information is provided in a spreadsheet and manually keyed into RAMM. Not all lights can currently be recorded in RAMM, because it is not possible to load some lights close to the border of other regions and some new subdivision lights.

Mercury reconciles the SWDC DUML load using the HHR profile in accordance with exemption 233. Wattages are derived from a RAMM database extract, which has been validated and updated by Dave Patten with corrections and changes since it was created in August 2019. On and off times are derived from a data logger.

Dave Patten is working with the SWDC to arrange for the missing and incorrect RAMM data identified before and during this audit to be updated, so that extracts can be provided directly from the database. It was hoped that this would be completed by the end of April 2020, but the COVID-19 lockdown has delayed this.

For new connections, lights are loaded into RAMM once the lights are vested in council. SWDC has requested developers not connect lights until this process is complete, and working to improve communications between developers and the council. SWDC monitors new subdivisions and keeps in close contact with Powerco to ensure that they are aware quickly when the lights are connected.

Fulton Hogan have a maintenance contract with SWDC and complete outage patrols in one town per month, so each town is patrolled every four months. Any outages identified during patrols are passed to PSW, who complete the repairs and provide any resulting database changes back to Dave Patten and Fulton Hogan.

SWDC's LED upgrade project is 99% complete. Some NZTA and decorative lights have not been replaced yet, and SWDC is investigating cost effective alternatives. During the LED upgrade project some lights were duplicated in RAMM. When the lights were initially loaded, they were plotted against the centreline and the replacement LEDs were plotted with an offset. In some cases the original light remained in the database when the replacement LED light was added, because they were recorded with different positions. Data cleansing has been completed by Dave Patten to identify instances where lights are very close together, indicating that they may be duplicated and validation processes have been updated to check the proximity of existing lamps when new lamps are added. During the field audit I found a small number of duplicated lights in the database, which are recorded as non-compliance as part of the database accuracy findings above. Corrections will also be processed in RAMM.

Festive and private lights

There are no festive or private lights in use in the SWDC region. I noted that there are some decorative lights connected to poles around the square in Martinborough and was advised that these are no longer connected. I could see that some of the lights were not properly connected to the pole, and they were clearly old.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 27-Feb-20 To: 27-Feb-20	The database is not confirmed as accurate with a 95% level of confidence. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. 20 items of load do not have sufficient location information recorded to enable them to be readily located. Two items of load had correct GPS coordinates, but incorrectly recorded street addresses. • A light situated at the end of Westwood Lane, Greytown was recorded against Kuratawhiti St, Greytown. • A light outside 17 Homestead Lane, Greytown was recorded against Udy Street, Greytown. 95 items of load had transposed GPS coordinates, with the northing value recorded in the easting field and vice versa. Dave Patten confirmed he will arrange for the GPS coordinates to be updated. Potential impact: Medium Actual impact: Unknown Audit history: Once Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate. SWDC is aware of the issues preventing all lights from being recorded in RAMM, and ensures that the extracts are validated and corrected as necessary before being provided to Mercury. When discrepancies were identified during the audit they were promptly investigated and updated information was provided to Mercury, which was used to produce revision submissions. The potential impact could be medium because the database could not be confirmed to be accurate with 95% confidence.

Actions taken to resolve the issue	Completion date	Remedial action status
The 20 items of load will be updated in the database once vested in council. We will follow up with SWDC to ensure the address and GPS details are corrected.	Sep 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The 20 items of load will be updated in the database once vested in council. We will follow up with SWDC to ensure the address and GPS details are corrected.	Sep 20	

3.2. Volume information accuracy (Clause 15.2 and 15.37B(c))

Code reference

Clause 15.2 and 15.37B(c)

Code related audit information

The audit must verify that:

- *volume information for the DUML is being calculated accurately*
- *profiles for DUML have been correctly applied.*

Audit observation

The submission was checked for accuracy for the month the database extract was supplied. This included:

- checking the registry to confirm that the ICP has the correct profile and submission flag, and
- checking the database extract combined with the on hours against the submitted figure to confirm accuracy.

Audit commentary

Mercury reconciles this DUML load using the HHR profile, and the correct profiles and submission types are recorded on the registry.

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233.

- Wattages are derived from an extract provided by SWDC each month. The field survey found that the best available estimate of field wattage is not precise enough to conclude that the database is accurate within ±5.0% as recorded in **section 3.1**. Most streets had little, if any, difference in wattage. The variability of the sample results was impacted by larger wattage differences for SH53 Revans St, Featherston (470W) and SH53 Kitchener St, Martinborough (112W), which significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold.
- On and off times are derived from a data logger.

I reviewed the submission information for the February 2020 initial and revision one submissions and confirmed that the calculation methodology was correct, and that wattages were based on the extract and on hours were based on data logger information.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
15 lamps had incorrect total wattages. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1.	Potential over submission of 730 kWh p.a.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed, and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant, and Mercury completes revision submissions where corrections are required. Mercury has not yet updated their processes to be consistent with the Authority's memo.

The RAMM database contains a "light install date" and a "lamp install date" but there is not a field for "livening date" for newly connected lights. When changes are processed in the database extract used for submission they are applied from the first day of the month, rather than the date that the change took effect.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Feb-20 To: 29-Feb-20	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. 15 lamps had incorrect total wattages, resulting in potential over submission of 171W or 730 kWh p.a. based on 4,271 burn hours. Corrections were processed in the database extract for February 2020, and revised submission information was provided for February 2020 revision 1. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Changes are not always recorded in the database extract from the date which they became effective. Potential impact: Medium Actual impact: Unknown Audit history: None Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate. SWDC is aware of the issues preventing all lights from being recorded in RAMM, and ensures that the extracts are validated and corrected as necessary before being provided to Mercury. When discrepancies were identified during the audit they were promptly investigated and updated information was provided to Mercury, which was used to produce revision submissions. The potential impact could be medium because the database could not be confirmed to be accurate with 95% confidence.

Actions taken to resolve the issue	Completion date	Remedial action status
We will work with SWDC to have the database reflect changes on a daily basis to ensure accurate consumption reporting.	Sep 20	Identified

Preventative actions taken to ensure no further issues will occur	Completion date	
We will work with SWDC to have the database reflect changes on a daily basis to ensure accurate consumption reporting.	Sep 20	

CONCLUSION

The SWDC DUML ICP switched to Mercury on 01/10/2019.

A RAMM database is maintained by Fulton Hogan. PSW complete all fieldwork for the SWDC street lights, with assistance from Fulton Hogan as required. Additions, removals, and changes to lights are communicated to Fulton Hogan. The information is provided in a spreadsheet and manually keyed into RAMM. Not all lights can currently be recorded in RAMM, because it is not possible to load some lights close to the border of other regions and some new subdivision lights.

A RAMM database extract was provided to Dave Patten in August 2019, which was validated and updated to include the missing lights described above. PSW communicates any light additions, removals or changes to Dave as they occur, and he updates the database extract to include these. A copy of this extract is provided to Mercury each month.

Dave Patten is working with the SWDC to arrange for the missing and incorrect RAMM data identified before and during this audit to be updated, so that extracts can be provided directly from the database. It was hoped that this would be completed by the end of April 2020, but the COVID-19 lockdown has delayed this.

Mercury reconciles the SWDC DUML load using the HHR profile in accordance with exemption 233. Wattages are derived from the database extract, and on and off times are derived from a data logger.

The accuracy of the database extract provided to Mercury was assessed:

Result	Percentage	Comments
The point estimate of R	103.4	Wattage from the survey is higher than the database wattage by 3.4%
R_L	91.9	With a 95% level of confidence it can be concluded that the error could be between -8.1% and +36.8%
R_H	136.8	

The results indicate that the best available estimate is not precise enough to conclude that the database is accurate within ±5%. Most streets had little, if any, difference in wattage. The variability of the sample results was impacted by larger wattage differences for SH53 Revans St, Featherston (470W) and SH53 Kitchener St, Martinborough (112W), which significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 8.1% lower and 36.8% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 2 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 4 kW and 18 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 7,100 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 16,700 kWh lower and 76,100 kWh higher than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed, and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot, which is non-compliant. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of 16 indicates that the next audit be completed in six months. SWDC was provided a list of all discrepancies identified during the audit, and has updated the database extract and is working to update RAMM. I recommend that the next audit is completed in a minimum of 12 months to allow time for the issues to be investigated and resolved in RAMM.

PARTICIPANT RESPONSE

Mercury have reviewed this report and their comments are contained within its body.