ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

NEW ZEALAND TRANSPORT AGENCY AND MERIDIAN ENERGY LIMITED NZBN: 9429037696863

Prepared by: Rebecca Elliot

Date audit commenced: 5 April 2022

Date audit report completed: 28 April 2022

Audit report due date: 01-Jun-22

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EXECUTIVE SUMMARY

This audit of the **Christchurch New Zealand Transport Authority** (**NZTA**) DUML database and processes was conducted at the request of **Meridian Energy Limited** (**Meridian**), 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 database is managed by Orion, the distributor for parts of the Canterbury area. The streetlight data is held in Orion's GIS and an SQL database, which interfaces with the GIS.

Meridian reconciles this DUML load using the DST profile. Submissions are based on the database information, with on and off times derived from data logger information.

I compared the database provided to the capacity information Meridian supplied to EMS for the month of March 2022 and I confirm the submission is accurate.

The field audit was undertaken of a statistical sample of 164 items of load on 25th April 2022. The field audit confirmed that the database accuracy is within the allowable +/-5% threshold.

This audit found three non-compliances and makes no recommendations.

The future risk rating of three indicates that the next audit be completed in 24 months. I have considered this in conjunction with Meridian's comments and recommend that the next audit be in 24 months.

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	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot.	Strong	Low	1	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum.	Strong	Low	1	Identified
Volume accuracy	3.2	15.2 and 15.37B(c)	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot.	Strong	Low	1	Identified
					Future Risk Rating	**3**	

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	Description	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

The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

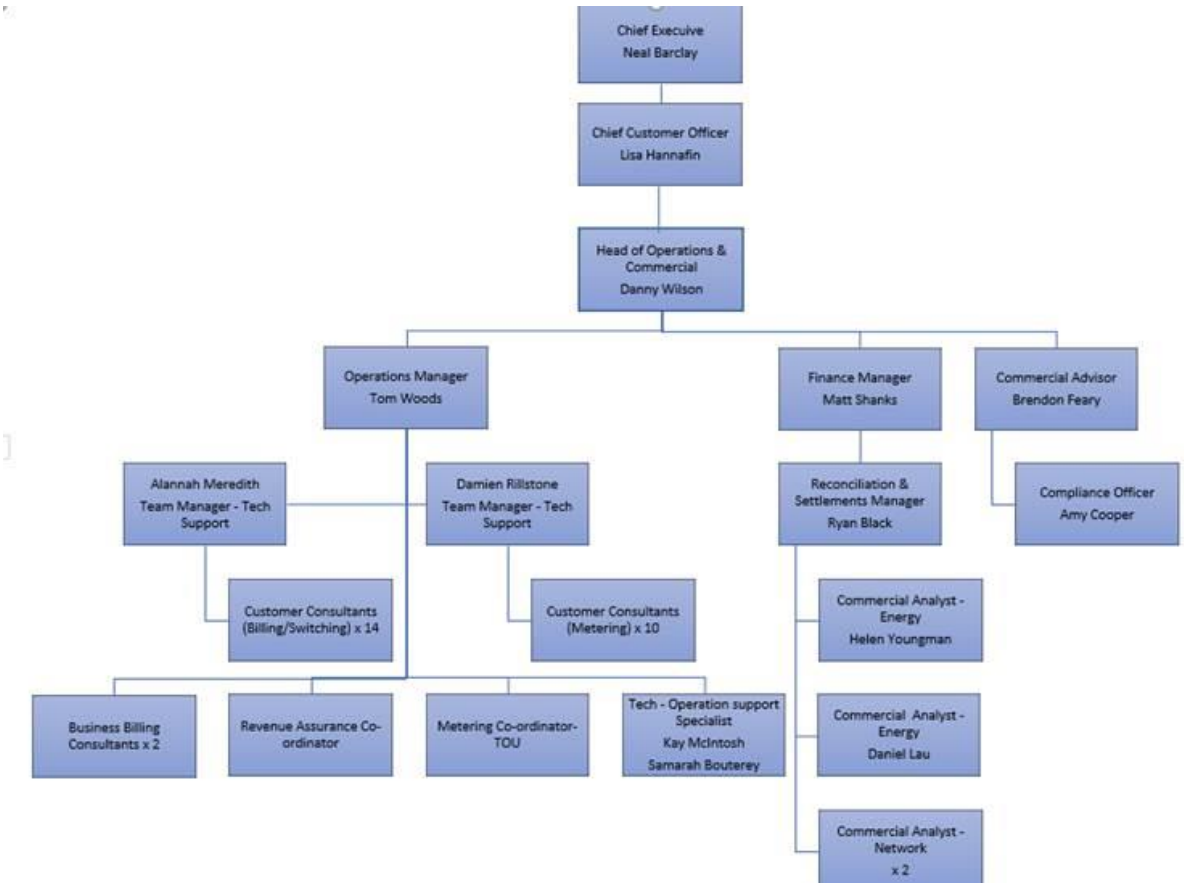
There are no exemptions in place relevant to the scope of this audit.

Audit commentary

Compliance is confirmed.

1.2. Structure of Organisation

Meridian Energy provided a copy of their organisational structure.



1.3. Persons involved in this audit

Name	Company	Role
Rebecca Elliot	Veritek Limited	Lead Auditor
Claire Stanley	Veritek Limited	Supporting Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Amy Cooper	Compliance Officer	Meridian Energy
Helen Youngman	Energy Data Analyst	Meridian Energy
Penny Lawrence	Operations Services	Orion

1.4. Hardware and Software

Orion use a purpose-built Oracle system for the management of the DUML information. Backup and restoration procedures are in accordance with normal industry protocols.

EMS and Meridian systems used in the process are discussed in their agent and reconciliation participant audit reports.

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)
0007131646RN811	Ref Orion TNZ GXP urban street light ICP	BRY0661	DST	95	15,220
0007131641RN5DB	Ref Orion_TNZ GXP rural street light ICP	CLH0111	DST	1	114
0007131642RN91B	Ref Orion_TNZ GXP rural street light ICP	HOR0331	DST	19	2,352
0007135577RN62F*	Ref Orion_TNZ GXP rural street light ICP	HOR0661	DST	0	0
0007131647RN454	Ref Orion_TNZ GXP urban street light ICP	ISL0331	DST	323	58,240
0007131644RN894	Ref Orion_TNZ GXP rural street light ICP	ISL0661	DST	1,983	342,955
0007152477RN913	Ref Orion_TNZ KBY0661 GXP rural street light ICP	KBY0661	DST	32	4,362
			Total	**2,453**	**423,243**

* Zero load is correct for ICP 0007135577RN62F. I have confirmed with Orion that there are no lights associated with this ICP.

1.7. Authorisation Received

All information was provided directly by Meridian or Orion.

1.8. Scope of Audit

This audit of the Orion DUML database and processes was conducted at the request of Meridian, 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.

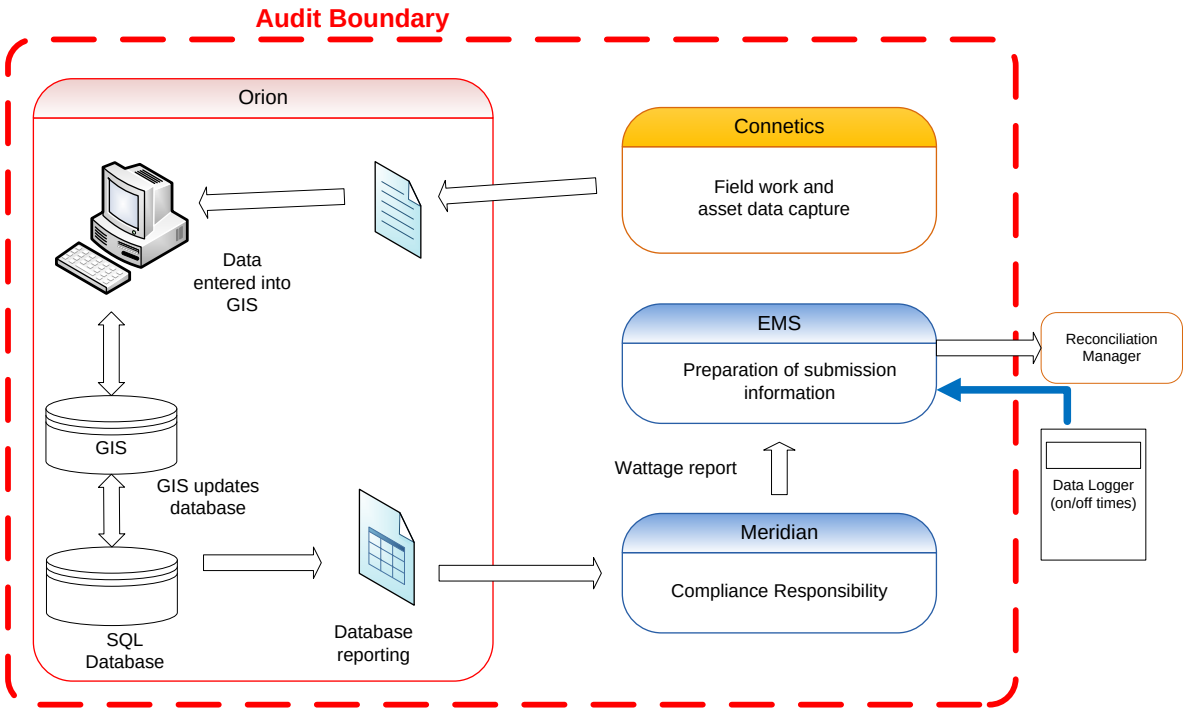
The audit was largely conducted in accordance with the audit guidelines for DUML audits version 1.1.

The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information based on the database reporting.

The NZTA boundary is part of the Orion Network. Orion manages their own database for NZTA. Monthly reporting is supplied to Meridian by Orion.

This audit covers the Orion database. The database is managed by Orion, the distributor for parts of the Canterbury area. The streetlight data is held in Orion's GIS and an SQL database. There is an interface between the SQL database and GIS. Orion engages Connetics for the fieldwork and asset data capture. Orion has a well-defined process to manage any additions/changes. Once the work is complete, the data is manually entered into the GIS, which then populates the database.

The diagram below shows the audit boundary for clarity.



1.9. Summary of previous audit

Meridian provided a copy of the last audit report undertaken by Rebecca Elliot of Veritek, completed in May 2020. Three non-compliances were identified, and no recommendations were made. The current status of the non-compliances is detailed below.

Table of Non-Compliance

Subject	Section	Clause	Non-Compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	Wattage incorrectly recorded in database for one new lamp resulting in an estimated under submission of 85kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot.	Cleared Still existing
Database accuracy	3.1	Clause 15.2 and 15.37B(b)	Wattage incorrectly recorded in database for one new lamp resulting in an estimated under submission of 85kWh per annum.	Cleared
Volume accuracy	3.2	15.2 and 15.37B(c)	Wattage incorrectly recorded in database for one lamp resulting in an estimated under submission of 85kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot.	Cleared 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 3 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

Meridian 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 the Orion 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

Meridian reconciles this DUML load using the DST profile. The on and off times are derived from a data logger read by EMS. This information is used to create a shape file. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process has been audited to confirm its accuracy and compliance.

I checked the extract provided by Orion against the March 2022 submission totals supplied by Meridian and found that submission matched the database.

The field audit confirmed the database is accurate within the acceptable +/-5% accuracy threshold. Examination of the database found 462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. The recorded as non-compliance below.

On 18 June 2019, the Electricity Authority issued a memo confirming that 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 data used is a snapshot and this practice is non-compliant.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 12-May-20 To: 04-Apr-22	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot. Potential impact: Low Actual impact: Low Audit history: Once Controls: Strong Breach risk rating: 1
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are recorded as strong because they mitigate risk to an acceptable level. The impact is assessed to be low, based on the kWh difference described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Meridian advised ORION of the inaccuracies and have confirmed they have been corrected. We are considering how we can redesign our processes to incorporate the calculation of volumes at a daily level rather than a monthly snapshot.	19/5/2022 Ongoing	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The majority of inaccuracies are due to lack of notification from the contractor (Connetics) regarding new installations and variations from initial designs. Meridian will work with Connetics to provide Orion with the install updates and changes to maintain the database in a timely manner	1/9/2022	

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 an ICP was recorded against each item of load.

Audit commentary

All Orion items of load have an ICP recorded against them.

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 Orion database contains fields for the street address and also GPS coordinates. There are 274 records that do not have a street number, in all cases there is GPS information.

Audit outcome

Compliant

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 databases were checked to confirm that they contained a field for lamp type and wattage capacity and included any ballast or gear wattage and that each item of load had a value recorded in these fields.

Audit commentary

Orion's database contains the manufacturers rated wattage and the ballast wattage. The extract provided has a field for 'Lamp Type' and an additional table was provided which contained more detail for each lamp type – description, amps, wattage (incl ballast) & lamp type category.

The accuracy of lamp descriptions, wattages and ballasts is recorded 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

A field audit was undertaken of a statistical sample of 164 items of load on 25th April 2022. The sample was selected from two strata.

Audit commentary

The field audit discrepancies found are detailed in the table below:

Address	Database Count	Field Count	Count differences	Wattage differences	Comments
Halswell Junction Rd	100	100	-	2	1 x 106W LED recorded in the database but 250W HPS located in the field. 1 x 51W LED recorded in the database but 250W HPS located in the field.
Halswell Junction Rd				21	21 x 154W LED recorded in the database but 21 x 152W LED found in the field.
Springs Rd				13	13 x 154 recorded in the database but 13 x 152W LED found in the field.
Weedons Ross Rd				38	38 x 154 recorded in the database but 38 x 152W LED found in the field.
Total	**2453**	**2453**	**-**	**74**	

No additional items of load were identified during the audit.

The database accuracy is discussed in **section 3.1**.

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 database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting 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 database has a complete audit trail of all additions and changes to the database information. The user who processed the change is stored in the back end of the database.

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

Plan Item	Comments
Area of interest	NZTA streetlights Christchurch region
Strata	The database contains 2,453 items of load in NZTA's area. The processes for the management of all NZTA items of load is the same. The database can be treated as two strata for all lights: • State Highways, and • Motorways.
Area units	I created a pivot table of the roads in the database and used a random number generator to select a total of 21 sub-units.
Total items of load	164 items of load were checked.

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority against the database.

Audit commentary

Field Audit Findings

A field audit was conducted of a statistical sample of 164 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	100.8	Wattage from survey is lower than the database wattage by 0.8%
R_L	99.5	With a 95% level of confidence, it can be concluded that the error could be between 0.5% and 1.8%.
R_H	101.8	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 1 February 2019 and the table below shows that Scenario A (detailed below) applies.

The conclusion from Scenario A is that the variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.5% lower and 1.8%. higher than the wattage recorded in the DUML database. Compliance is recorded because the potential error is less than 5.0%.

In absolute terms the installed capacity is estimated to be 3 kW higher than the database indicates.

There is a 95% level of confidence that the installed capacity between 2 kW lower to 7 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 14,400 kWh higher than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between -8,900 kWh p.a. lower to 31,900 kWh p.a. higher than the database indicates.

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 %

Lamp description and capacity accuracy

The Orion database was found to have no inaccuracies when compared to the published standardised wattage table.

It was identified in the field audit that 154W LED lamps recorded in the database were labelled as 152W LED. It was confirmed by Connetics that the label on the lamp in the field confirms the correct wattage.

Database Lamp Type	Correct Lamp type	Variance	Database Quantity	Estimated Annual kWh effect on consumption
154W LED	152W LED	-2	462	3,946

The incorrect capacities will be resulting in an estimated over submission of 3,946 kWh per annum (based on annual burn hours of 4,271 as is detailed in the DUML database auditing tool).

Change management process findings

Fault, maintenance, new connection, and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the Streetlighting/DUML database and GIS. For new developments, this paperwork includes "as built" plans.

Upon receipt, paperwork is checked for completeness and accuracy and any issues are followed up with the contractor. The information is sent to the GIS team so that the GIS can be updated, and then returned to the connections team to update the Streetlighting/DUML database from the date the change or new connection was effective. Once data entry is complete, the values loaded are checked against the paperwork provided, and some spot checks in the field are completed. Paperwork is normally promptly provided electronically and processed within two to three business days of receipt.

All jobs are tracked using job numbers by the connections team as part of the works management process. Late paperwork from contractors, and late updates by the GIS team are followed up. A checklist is followed to ensure that all steps in the process are completed.

Orion's approved contractors have access to a web-based version of the Streetlighting/DUML database in the field and advise Orion's connections team if they notice any discrepancies in the data recorded. Orion's operation team acts on these notifications and checks and updates the data where necessary.

There have been an additional 491 lamps added to the database since the last audit, this is due to the lamps on the new Christchurch Motorway being added to the database.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 23-Apr-21 To: 31-Mar-22	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. Potential impact: Low Actual impact: Low Audit history: Once Controls: Strong Breach risk rating: 1
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are recorded as strong because they mitigate risk to an acceptable level. The impact is assessed to be low, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Meridian advised ORION of the inaccuracies and have confirmed they have been corrected.	19/5/2022	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The majority of inaccuracies are due to lack of notification from the contractor (Connetics) regarding new installations and variations from initial designs. Meridian will work with Connetics to provide Orion with the install updates and changes to maintain the database in a timely manner	1/9/2022	

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 burn hours against the submitted figure to confirm accuracy.

Audit commentary

Meridian reconciles this DUML load using the DST profile. The on and off times are derived from a data logger read by EMS. This information is used to create a shape file. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process has been audited to confirm its accuracy and compliance. The field audit confirmed the database is accurate within the acceptable +/-5% accuracy threshold.

I checked the extract provided by Orion against the March 2022 submission totals supplied by Meridian and found that submission matched the database.

The database accuracy is discussed in **section 3.1.** The field audit confirmed that the database is accurate. Examination of the database found 462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. This is recorded as non-compliance below.

On 18 June 2019, the Electricity Authority issued a memo confirming that 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 data used is a snapshot and this practice is non-compliant.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 12-May-20 To: 04-Apr-22	462 152W LED lamps recorded incorrectly in the database at 154W LED, resulting in over submission of 3,946 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot. Potential impact: Low Actual impact: Low Audit history: Once Controls: Strong Breach risk rating: 1
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are recorded as strong because they mitigate risk to an acceptable level. The impact is assessed to be low, based on the kWh difference described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Meridian advised ORION of the inaccuracies and have confirmed they have been corrected.	19/5/2022	Identified
We are considering how we can redesign our processes to incorporate the calculation of volumes at a daily level rather than a monthly snapshot.	Ongoing	
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The majority of inaccuracies are due to lack of notification from the contractor (Connetics) regarding new installations and variations from initial designs. Meridian will work with Connetics to provide Orion with the install updates and changes to maintain the database in a timely manner	1/9/2022	

CONCLUSION

The database is managed by Orion, the distributor for parts of the Canterbury area. The streetlight data is held in Orion's GIS and an SQL database, which interfaces with the GIS.

Meridian reconciles this DUML load using the DST profile. Submissions are based on the database information, with on and off times derived from data logger information.

I compared the database provided to the capacity information Meridian supplied to EMS for the month of March 2022 and I confirm the submission is accurate.

The field audit was undertaken of a statistical sample of 164 items of load on 25th April 2022. The field audit confirmed that the database accuracy is within the allowable +/-5% threshold.

This audit found three non-compliances and makes no recommendations.

The future risk rating of three indicates that the next audit be completed in 24 months. I have considered this in conjunction with Meridian's comments and recommend that the next audit be in 24 months.

PARTICIPANT RESPONSE

Meridian has reviewed this report and their comments are contained within the report.