ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

NZTA OTAGO AND TRUSTPOWER

Prepared by: Rebecca Elliot

Date audit commenced: 12 December 2018

Date audit report completed: 15 February 2019

Audit report due date: 1 March 2019

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EXECUTIVE SUMMARY

This audit of the NZTA Otago (NZTA) Aurora network DUML database and processes was conducted at the request of Trustpower Limited (Trustpower) 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 Aurora and the data is held in their GIS system. Delta is the field contractor for maintenance but not the LED replacement. McKay Electrical have been engaged by NZTA to undertake an LED rollout, but as they have no relationship with Aurora they are unwilling to provide Aurora with these changes. This was evident in the field audit where LED lights are replacing old HPS lights, these changes are not being updated in the database and therefore as these lights continue to be rolled out the database accuracy will decrease. I recommend that Trustpower engage with NZTA to ensure the work carried out by McKay Electrical is updated in the Aurora database.

The future risk rating of 16 indicates that the next audit be completed in six months. I have considered this in conjunction with Trustpower's responses and recommend that the next audit be in nine months time to allow time for Trustpower to work with NZTA and associated contractors. Four non-compliances were identified, and one recommendation is made. 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	Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum if these were used for submission. Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum.	Moderate	Medium	4	Identified
All load recorded in the database	2.5	11(2A) and (d) of Schedule 15.3	9 additional items of load found in the field sample.	Moderate	Medium	4	Investigating
Database accuracy	3.1	15.2 and 15.37B(b)	The database accuracy is assessed to be 96.9% indicating an estimated over submission of 16,100 kWh per annum. Eight items of load with incomplete lamp descriptions. Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum if these were used for submission.	Moderate	Medium	4	Investigating

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Volume information accuracy	3.2	15.2 and 15.37B(c)	Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum.	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	Description	Remedial Action
Tracking of Load Changes	2.6	Clause 11(3) of schedule 15.3	Trustpower engage with NZTA to ensure changes made by McKay are updated in the Aurora database.

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.

Audit commentary

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

1.2. Structure of Organisation

Trustpower provided a copy of their organisational structure.

1.3. Persons involved in this audit

Auditor:

Rebecca Elliot

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Robbie Diederen	Reconciliation Analyst	Trustpower
Richard Starkey	Commercial Development Manager	Aurora
Tammy Adams	Data Architect	Aurora
Suzanne Fraser	Contracts co-ordinator	Delta

1.4. Hardware and Software

The GIS database used for the management of DUML is managed by Aurora.

The database back up is in accordance with standard industry procedures. Access to the database is secure by way of password protection.

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)
0000027638CECB5	Central Otago State Highways FKN0331	FKN0331	STL	315	69,619
0000486694CE943	Central Otago State Highways CYD0331	CYD0331	STL	227	36,378
0000486695CE506	Central Otago State Highways CML0331	CML0331	STL	84	16,332
TOTAL				626	122,329

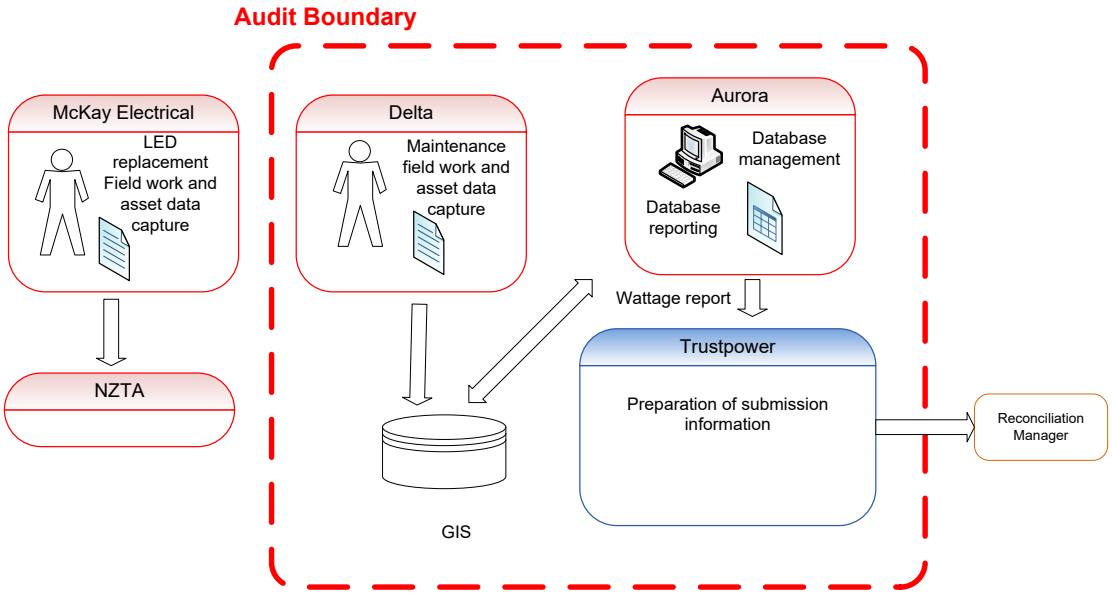
1.7. Authorisation Received

All information was provided directly by Trustpower, Aurora and Delta.

1.8. Scope of Audit

The database is managed by Aurora and the data is held in their GIS system. Delta is the field contractor for maintenance but not the LED replacement. Reports are received monthly by Trustpower. McKay Electrical have been engaged by NZTA to undertake an LED rollout, but as they have no relationship with Aurora they are unwilling to provide Aurora with these changes.

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 boundary for clarity.



The audit was carried out at on January 23 & 24, 2019. The field audit was undertaken of 152 lights using the statistical sampling methodology.

1.9. Summary of previous audit

The previous audit was completed in March 2018 by Rebecca Elliot of Veritek Limited. Four non-compliances were identified, and no recommendations were made. The statuses of the non-compliances and recommendations are described below.

Subject	Section	Clause	Non-compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	The database accuracy is assessed to be 90.9% indicating an estimated over submission of 46,200 kWh per annum. Incorrect ballasts applied resulting in an estimated under submission of 802.95 kWh.	Still existing
Description and capacity of load	2.4	11(2)(c) of Schedule 15.3	Ten items of load with incomplete lamp descriptions.	Recorded as non-compliance under **section 3.1** in this report
Database accuracy	3.1	15.2 and 15.37B(b)	The database accuracy is assessed to be 90.9% indicating an estimated over submission of 46,200 kWh per annum. Incorrect ballasts applied resulting in an estimated under submission of 802.95 kWh.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database accuracy is assessed to be 90.9% indicating an estimated over submission of 46,200 kWh per annum. Incorrect ballasts applied resulting in an estimated under submission of 802.95 kWh.	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

Trustpower 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. Compliance is confirmed.

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.

Audit commentary

Trustpower reconciles this DUML load using the STL profile. The on and off times are derived from data logger information. Trustpower receive a monthly wattage report.

I recalculated the submissions for December 2018 using the data logger and the database information. I confirmed that the calculation method was correct, but I found a variance as detailed in the table below.

ICPs	Fittings number from December submission	Fittings number from database extract	Differences	kWh value submitted	Calculated kWh value from database extract	Differences
0000027638CECB5	315	315	0	18,297.13	18,519.12	221.99
0000486694CE943	226	227	1	9,856.45	9,676.79	-179.66
0000486695CE506	85	84	-1	4,251.03	4,344.42	93.39
Total month kWh difference						135.72.

The variance above is due to two factors:

- Trustpower apply their own ballasts when they calculate the monthly kWh value as the Aurora database has some incorrect ballasts (as detailed in **section 3.1**);
- the lamp wattage values applied by Trustpower were checked and I found some incorrect ballasts applied resulting in 18.35kWh of over submission, when this is subtracted from the overall under submission figure above, there was a total of 117.37 kWh of under submission for the month of December; annualised this indicates a potential under submission of 1,408.31 kWh.

The code requires this to be calculated within the database. This is recorded as non-compliance below.

The database accuracy was assessed to be 96.9% indicating an estimated over submission of 16,100 kWh per annum. This is detailed in **sections 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-May-18 To: 31-Dec-18	Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum if these were used for submission. Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum. Potential impact: Medium Actual impact: Medium Audit history: Once Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Will make the correction on the TP DB	8/3/2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
To get Aurora to include ballasts on their DB	1/5/2019	

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 is recorded for each item of load.

Audit commentary

All items of load had an ICP recorded as required by this clause.

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 either the nearest street address and Global Positioning System (GPS) coordinates for each item of load and users in the office and field can view these locations on a mapping system.

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 database was checked to confirm that it contained a field for lamp type and wattage capacity and included any ballast or gear wattage.

Audit commentary

The database contains three fields for lamp description, wattage, and "lamp losses". The lamp losses (ballast wattage) is expected to be a calculated figure which accounts for any variation from the input wattage and includes losses associated with ballasts. Examination of the database found all the wattages and lamp losses were populated for all items. The accuracy of these are discussed in s**ection 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 152 items of load on 22 & 23 January 2019.

Audit commentary

The field audit was accurate for all but the following items detailed in the table below:

Street	Database count	Field count	Light count differences	Wattage recorded incorrectly	Comments
The Half Mile	9	9		1	70W HPS found in the field. Recorded as 160 MV in the database
Shotover Delta Road	1	1		1	149W LED found in the field. Recorded as 250W HPS in the database
Stanley Street	8	9	-1 +2	2	1x pedestrian crossing beacon light not found in the field 2x extra LED found in the field 2x LED found in the field. Recorded in the database as 250W HPS
State Highway 6A	33	34	-1 +2	1	1x 250W HPS not found in the field 1x extra 150W HPS and 1x extra 103W LED found in the field 1x LED found in the field. Recorded in the database as 250W HPS
Alpha Street	2	2		1	1x 103W LED found in the field. Recorded as 150W HPS in the database
Barry Avenue	3	3		1	1x 103W LED found in the field. Recorded as 150W HPS in the database
Iles Street	6	10	4	3	4x extra LEDs found in the field 3x 103W LED found in the field. Recorded as 150W HPS in the database
Murray Terrace	2	2		2	2x 103W LED found in the field. Recorded as 150W HPS in the database

Street	Database count	Field count	Light count differences	Wattage recorded incorrectly	Comments
Sunhaven Cove	4	4		3	3x 103W LED found in the field. Recorded as 150W HPS in the database
Leask Street	12	13	1		1x extra 125W MV found in the field
Grand Total	**152**	**159**	**9**	**10**	

Nine additional items of load were found in the field. This is recorded as non-compliance below. The overall database accuracy is detailed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.5 With: Clause 11(2A) and (d) of Schedule 15.3 From: 01-May-18 To: 31-Dec-18	9 additional items of load found in the field sample. Potential impact: High Actual impact: Medium Audit history: None Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate due to the volume of additional lights found in the field. The impact is assessed to be medium due to the number of differences found in the field and total estimated kWh difference detailed in **section 3.1**.

Actions taken to resolve the issue	Completion date	Remedial action status
Working with NZTA and Aurora to get the DB update from field contractor	1/5/2019	Investigating
Preventative actions taken to ensure no further issues will occur	**Completion date**	
To get NZTA to understand the importance of the DB and to keep up to date	19/3/2019	

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

Any changes that are made during any given month take effect from the beginning of that month. The information is available which would allow for the total load in kW to be retrospectively derived for any day. On 20 September 2012, the Authority sent a memo to retailers and auditors advising that tracking of load changes at a daily level was not required if the database contained an audit trail. I have interpreted this to mean that the production of a monthly "snapshot" report is sufficient to achieve compliance.

The database tracks additions and removals as required by this clause.

The database is managed by Aurora and the data is held in their GIS system. Delta carry out all fault and maintenance work. Any changes made in the field are passed to Aurora to update the database.

NZTA have engaged McKay Electrical to undertake LED replacements. This information is not being provided to Aurora and explains why the field audit found a large number of LED which are still recorded in the Aurora database as HPS lights. As McKay Electrical have been engaged by NZTA directly and have no relationship with Aurora they are unwilling to provide Aurora with these changes. I recommend that Trustpower engage with NZTA directly to ensure the work carried out by McKay Electrical is updated in the Aurora database.

Recommendation	Description	Audited party comment	Remedial action
Regarding: Clause 11(3) of schedule 15.3	Trustpower engage with NZTA to ensure changes made by McKay are updated in the Aurora database.	Participant Comments	Choose an item.

Delta carries out outage patrols in the urban areas as part of their patrols for Queenstown Lakes DC and Central Otago DC.

No festive lighting is connected to the Aurora NZTA unmetered streetlight network.

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

A complete audit trail of all additions and changes to the database information.

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

The DUML Statistical Sampling Guideline was used to determine the database accuracy. The table below shows the survey plan.

Plan Item	Comments
Area of interest	NZTA Otago lights on the Aurora network
Strata	The database contains items of load Otago Aurora network area. The area has two distinct sub groups of urban and rural. The processes for the management of NZTA Aurora Otago items of load are the same, but I decided to place the items of load into four geographical strata, as follows: 1. Alexandra 2. Frankton 3. Queenstown 4. Rural
Area units	I created a pivot table of the roads in each area and I used a random number generator in a spreadsheet to select a total of 30 sub-units.
Total items of load	152 items of load were checked.

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

Audit commentary

A statistical sample of 152 items of load found that the field data was 96.9% of the database data for the sample checked. This is not within the required database accuracy of 2.5%+/-. The statistical sampling tool reported with 95% confidence the precision of the sample was 7.1% and the true load in the field will be between 93.4% to 100.5% of the load recorded in the database. The sample is not sufficiently precise to be able to determine the database accuracy but indicates that the database is likely to be over submitting. This is likely due to LEDs replacements being carried out by McKay Electrical and these updates not being passed to Aurora to update in their database. This is discussed in **section 2.6**.

The tool indicated that there is potentially 16,100 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool) of over submission. The statistical sampling tool reported with 95% confidence that there is a potential estimated submission variance range of between 34,600 kWh of over submission and 2,600 kWh under submission.

Wattages for all items of load were checked against the published standardised wattage table produced by the Electricity Authority in the database and found a small number of errors. Eight items of load had an incomplete lamp description as detailed in the tables below:

Lamp descriptions	Lamp Quantity
LED Lighting	1
Monument light, or ped cross, no beacons	2
Pedestrian crossing beacon with floodlights	4
Street name illuminator or Bollard	1

Incorrect ballasts applied as follows:

Lamp descriptions	Ballast variance	Lamp quantity affected	Wattage variance
100W HP sodium street light	-1	3	-3
125W MV street light	1	45	45
135W Sox Sodium street light	26	6	156
150W HP sodium streetlight	7	1	7
160W MV street light	5	2	10
250W HP sodium streetlight	-2	2	4
400W MV street light	13	4	52
60W HP sodium street light	4	2	8
LED Lighting	-10	4	-10
Total			269

Trustpower apply their own ballasts when they calculate the monthly kWh value, but I calculated the impact on submission if they were used and this indicates an estimated under submission of 1,149 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-May-18 To: 31-Dec-18	The database accuracy is assessed to be 96.9% indicating an estimated over submission of 16,100 kWh per annum. Eight items of load with incomplete lamp descriptions. Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum, if these were used for submission. Potential impact: Medium Actual impact: Medium Audit history: Once Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Contact Aurora, NZTA and McKay Electrical to ascertain why this problem exists	1/5/2019	Investigating
Preventative actions taken to ensure no further issues will occur	**Completion date**	
As above	19/3/2019	

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 all ICPs have the correct profile and submission flag
- checking the database extract combined with the burn hours against the submitted figure to confirm accuracy.

Audit commentary

Trustpower reconciles this DUML load using the STL profile. The on and off times are derived from data logger information. Trustpower receive a monthly wattage report. As detailed in **section 2.1**, the check of the submission figures submitted by Trustpower against the database extract found under submission of 117.37 kWh for the month of December resulting in an estimated annual under submission of 1,408.31 kWh.

Trustpower apply their own ballasts when they calculate the monthly kWh value as the Aurora database has some incorrect ballasts (as detailed in **section 3.1**). The code requires this to be calculated within the database. This is recorded as non-compliance below.

The database accuracy was assessed to be 96.9% indicating an estimated over submission of 16,100 kWh per annum. This is detailed in **sections 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-May-18 To: 31-Dec-18	Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum. Potential impact: Medium Actual impact: Medium Audit history: None Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Will make the correction on the TP DB	8/3/2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
To get Aurora to include ballasts on their DB	31/3/2019	

CONCLUSION

The database is managed by Aurora and the data is held in their GIS system. Delta is the field contractor for maintenance but not the LED replacement. McKay Electrical have been engaged by NZTA to undertake an LED rollout but as they have no relationship with Aurora they are unwilling to provide Aurora with these changes. This was evident in the field audit where LED lights are replacing old HPS lights, these changes are not being updated in the database and therefore as these lights continue to be rolled out the database accuracy will decrease. I recommend that Trustpower engage with NZTA to ensure the work carried out by McKay Electrical is updated in the Aurora database.

The future risk rating of 16 indicates that the next audit be completed in six months. I have considered this in conjunction with Trustpower's responses and recommend that the next audit be in nine months time to allow time for Trustpower to work with NZTA and associated contractors. Four non-compliances were identified, and one recommendation is made.

Participant response

I have spoken to the NZTA Area Manager John Jarvis who has told me the only LED's that have been installed in the area on their light system are a result of replacement of faulty fittings. There is no LED roll out in the area yet. He has no knowledge of McKay Electrical working on the S/L's but they may be a contractor for LDC which they do have a present contract.