McDonald's Energy Management Programme

Electricity Savings Report for LED Retrofit Project Milestone 6: Targeting 4 GWh in Energy Savings

Document prepared for:

Bhavisha Lal
Construction Project Manager
McDonald's Restaurants (NZ) Ltd
Email: bhavisha.lal@nz.mcd.com

Document prepared by:

Olivia Winn
Energy Analyst
Energy Solution Providers Ltd (ESP)
Email: olivia.winn@espnz.co.nz

Document checked by:

Trevor Nash (CMVP)
Consulting Services Manager, ESP

5th October 2017

Project Reference: P003005

1 EXECUTIVE SUMMARY

ESP was engaged by McDonald's Restaurants (NZ) to verify the savings at 3 sites, representing an LED retrofit project across 59 restaurants nationwide. The supplier and installation contractor was Active Lighting Ltd. The Energy Efficiency and Conservation Authority (EECA) were the funding partner.

This M&V Report is based on the principles of measurement and verification outlined in the International Performance Measurement and Verification Protocol (IMPVP) Volume 1, EVO 10000 – 1:2012. An earlier report, *Savings Verification Report for LED Retrofit Project at Ti Rakau Drive and Constellation Drive Restaurants*, dated 13th October 2015, provided lamp power measurements that have been relied upon in this report. However, the uncertainty arising from slight differences between the provided data and the observed lighting at the site inspections means that these results cannot be considered to meet the stringent requirements of the IPMVP. The final margin of error is unlikely to be significantly more than the discrepancy factor applied in the analysis.

This energy savings in this report relate specifically to data sheets for 57 upgraded sites and 2 previously verified sites (Ti Rakau and Constellation Drive). Three sites were visited to compare the provided data sheets with the actual installations (Britomart, Glenfield and Grey Lynn).

The results from this verification analysis indicate that:

- **The cumulative energy savings of 4 841 693 kWh achieved as a projection to 30 November 2017 surpass the target of 4 000 000 kWh.**
- The average energy saving per site is 82 063 kWh, but note the varying installation dates.

Overall, light levels have been maintained or improved when compared to the baselines for Ti Rakau and Constellation Drive. In one area where LEDs replaced compact fluorescent bulbs, the light levels are now slightly less than the baseline measurements, but would not be considered unsafe.

2 Contents

Contents

3 PROJECT BACKGROUND

McDonalds has made substantial progress in completing LED upgrades at its sites across New Zealand.

The contractor provided data sheets for each site; these showed the number and type of lamps originally installed, and the number and type of lamps used in the LED upgrade. The energy savings were calculated from the difference in annual consumption. ESP was contracted to independently check the stated savings. The supplied site data sheets were reviewed and site inspections of three Auckland restaurants were carried out, namely the Britomart, Grey Lynn and Glenfield restaurants.

The previously completed work (Milestone 4) at Ti Rakau and Constellation Drive was used as a comparative baseline in this project. The intent was to confirm that light levels should be appropriate and to verify the calculated savings for each fitting type. Additionally, site inspections were carried out at the Britomart, Glenfield and Grey Lynn restaurants; the intent was to confirm that the installed amount and type of lighting was as reported in the site data sheets provided by the contractor.

A signoff sheet and summary data sheet were created by ESP, and the summary data completed by the contractor.

Based on the data provided and the site inspections done by ESP, the savings target of 4 000 000 kWh has been achieved with a large margin.

3.1 Project Information

PROJECT:	
Client Name	McDonald's Restaurants (NZ) Ltd
Site Location	Various across New Zealand
Building/Facility Description	Fast food restaurant
Funding Partner	EECA
ECMs:	
Lighting	Replace all restaurant lighting with LEDs, in some cases excluding external signage and car-parking lights
Contractor	Active Lighting Ltd

3.2 M&V Information

FRAMEWORK:	
IPMVP Option	Option A (Retrofit Isolation: Key Parameter Measurement)
MEASUREMENT:	
Measured Parameter	Lighting hours of operation; number of fittings
Measurement Strategy	Light count Spot measurements of light levels at various points Comparison to provided data sheets Confirm hours of operation with shift manager
Measurement Boundary	Sample of three sites Lighting circuits only (excludes interactive effects)
Monitoring Period	Single measurement post installation.
ANALYSIS:	
Savings Determination	Avoided Energy
Basis of Routine Adjustments	None – the sites' opening hours were used to determine the hours of operation and seasonal variation was neglected for exterior lighting.
Analysis Methodology	Comparison of Milestone 4 data (Ti Rakau and Constellation Drive) with contractor's data sheets Comparison of measured data with contractor's data sheets Calculation of number of additional sites required to meet savings target
REPORTING:	
Reporting Schedule	Report to verify the savings so far and to determine the additional requirements for meeting the savings target.

4 PROJECT SAVINGS VERIFICATION

4.1 Comparison to Milestone 4 (Ti Rakau and Constellation Drive)

The previously completed work at Ti Rakau and Constellation Drive, for Milestone 4, was intended for use as a baseline in this project. However, a larger range of lighting was originally used in the following 57 stores upgraded which in turn required a wider range of LED replacements. Also, in the Ti Rakau and Constellation Drive upgrades, the total load (including ballast) was measured for each original fitting; in the Milestone 6 upgrade, a ballast factor of 7.5% was applied universally to all original fittings. Thus, a more thorough investigation into the ballast energy consumption was required.

The ballast consumption measured for each fitting in the Milestone 4 upgrade was used as the basis for detailed investigation of several stores in the Milestone 6 upgrade. The results of this analysis are shown in the following table.

SITE	TOTAL ANNUAL CONSUMPTION WITHOUT BALLAST (kWh/a)	TOTAL ANNUAL CONSUMPTION WITH BALLAST (kWh/a)	BALLAST FACTOR
5 Cross Roads	16 594	18 235	9.9%
Albany	17 080	17 820	4.3%
Airport Drive Thru	16 088	17 573	9.2%
Britomart	9 269	9 746	5.1%
Glenfield	17 596	19 239	9.3%
Grey Lynn	4 994	5 412	8.4%
Total	**81 621**	**88 025**	**7.8%**

The use of a slightly conservative **7.5% overall ballast factor** is thus supported through case-by-case investigation of several Milestone 6 stores.

4.2 Site Inspection Adjustments

Site inspections were carried out at the Britomart, Glenfield and Grey Lynn restaurants; the intent was to confirm that the installed amount and type of lighting was as reported in the site data sheets provided by the contractor. It was found that there were several small discrepancies between the site data sheets and what was observed onsite. Thus, the savings reported by the contractor were not consistent with the savings calculated by ESP following site inspections of three sites in Auckland. The following table outlines the major contributors to discrepancies between the expected savings and the savings calculated by ESP.

CAUSE OF KEY DISCREPANCIES	EFFECT*	SITE
Emergency lighting not upgraded with LED	-7%	Britomart
Incorrect light count (several 4ft T5s were counted as 5ft T5s)	-7%	Glenfield
Incorrect hours of operation	-6%	Grey Lynn
Storage area not upgraded with LED (store owner intended to renovate)	-5%	Britomart
Emergency lighting not upgraded with LED	-3%	Glenfield

*Effect = Lost fraction of proposed savings

We understand that the emergency lighting was not upgraded at five sites (Albany, Britomart, Christchurch Airport, Glenfield and Riccarton) as this would require further compliance work. Thus, the effect of emergency lighting was not included at all other sites.

The resulting discrepancies between reported and calculated savings for the three sites visited required an "emergency lighting factor" to be applied to five sites and a "discrepancy factor" to be applied to all sites reported in the summary sheet. The site discrepancies and total discrepancy across the three sites are shown in the following table.

SITE	STATED ANNUAL ENERGY CONSUMPTION (kWh/a)	CALCULATED ANNUAL ENERGY CONSUMPTION (kWh/a)	EMERGENCY LIGHTING FACTOR	DISCREPANCY FACTOR
Britomart	65 097	57 413	-6.5%	-5.3%
Glenfield	99 847	89 127	-3.1%	-7.6%
Grey Lynn	28 358	26 407	NA	-6.9%
Total	**193 302**	**172 947**	**-4.4%**	**-6.7%**

A **discrepancy factor of -6.7%** was applied across all sites to account for differences between the contractor's data sheets and the final installs. An **emergency lighting factor of -4.4%** was applied to the Albany, Britomart, Christchurch Airport, Glenfield and Riccarton sites.

4.3 Energy Savings Analysis

The energy consumption for the original fittings was calculated as following:

Original Annual Energy Use = rated load x estimated annual hours x 107.5% ballast factor

The energy consumption after the LED upgrade project was calculated as following:

Retrofit Annual Energy Use = rated load x estimated annual hours

The energy savings for each site were calculated based on the following equation:

Annual Savings = (Original Energy Use – Retrofit Energy Use) x 93.3% discrepancy factor

Or at the sites where there was emergency lighting the following equation was used:

Annual Savings = (Original Energy Use – Retrofit Energy Use) x 88.9% discrepancy & lighting factor

The total energy savings since the commissioning date for each store was calculated as following:

Total Savings = Annual Savings / Days of Operation x Days Open per Year

The hours estimated by the contractor were based on the restaurants' hours of operation for interior lighting, and hours open after dark for exterior lighting. It was assumed that the average restaurant is open for 364 days per year, to account for those which are closed on certain public holidays.

The total savings were the sum of the cumulative savings from all 59 completed sites (including Ti Rakau and Constellation Drive) and 1 site in progress (Panmure). The cumulative energy savings were calculated to be **4 841 693 kWh**. The average energy savings per site were 82 063 kWh. The complete list of energy savings for each site is in Appendix A.

4.4 Lighting Levels

An important consideration in this project was ensuring that light levels were maintained at a level appropriate for the activity in each area. The baseline readings for Milestone 4 were used to compare the light level readings taken on the site visits. It should be noted that measurements for Milestone 4 and Milestone 6 were both taken during the daytime; no light level readings for exterior lighting were taken in either project.

In most cases the light levels were in the range of or greater than the Milestone 4 baseline measurements taken for areas of similar activity. Exceptions are as following:

- The loading dock / rubbish disposal area at Britomart had light levels less than for the freezer and roof ladder at Ti Rakau. The levels of 160 – 230 may be considered unacceptable, but would be sufficient for safety. This area is still lit by the original fluorescent 5ft T5 twin fittings and has not been upgraded.
- The two party rooms at Glenfield had lights levels lower than for the party rooms at Ti Rakau and Constellation Drive. The levels of 120 – 190 lux may be considered unacceptable for the activity, but would not be considered unsafe. This area was originally lit with PLL fittings compact fluorescent lamps, and now has PLL fitting LED lamps.

The summary of light level readings for the three stores is in Appendix B.

4.5 Conclusions

On the basis of this analysis:

- The cumulative energy savings of 4 841 693 kWh achieved to the end of November 2017 surpass the targeted savings of 4 000 000 kWh with a substantial (21%) margin.

The discrepancy factor in the 54 sites that were not visited or verified as part of Milestone 4 was calculated from the average of the three sites visited. The assumptions used in calculation can be tested by visiting additional sites, however the final margin of error in the analysis is unlikely to be significant with respect to the large margin by which the savings target was surpassed.

Light levels have generally been maintained or improved except in a small number of locations which should be individually addressed as soon as possible, and the learnings from these used in future installations.

5 FOLLOW-UP ACTIVITIES

5.1 Remedial Works

In a couple of cases in the site inspections, the LED upgrade was not completed and the lamps were left with the store owner to be installed at a later date. If these installations are completed at all sites where this has happened, the discrepancy factor would be smaller and the total savings larger.

5.2 Further Savings Opportunities

Lighting in storage, packing and rubbish areas was on manual control in several cases, meaning that it could be left on when not required and so could be a source of energy waste. By implementing sensor control (daylight, motion) or push button timers, energy consumption for lighting could be reduced.

High light levels were observed in several interior locations close to windows that let in large amounts of natural light. When natural daylight is available it may be possible to turn off (or dim) selected lights without significant effect on light levels. Also, many areas of the restaurants will be vacant for extended periods (especially at the stores which operate 24/7), so again lights could be switched off (or dimmed) to suit occupancy. The new lights should respond immediate to any control input calling for them to switch on. Both of these options may provide additional savings but it is recognised that the nature of the client's business may mean considerations of aesthetics and perception must take priority.

We recommend that budget-level business cases be developed for each of the above options to establish whether there is a good case for further development.

APPENDIX A – SAVINGS SUMMARY

Derived Ballast Factor:		7.5%	End Date	Days Open per Year	Original Fittings				LED Retrofit			Energy Savings from Retrofit		
Derived Emergency Lighting Factor:		-4.4%												
Derived Discrepancy Factor:		-6.7%	30/11/2017	364										
Store	**Progress Status**	Hours of Operation	Start Date	Days of operation	Number of Original Fittings	Pre-Ballast Load	Total Load (with Ballast)	Annual Energy Use	Number of LED Fittings	Total Load	Annual Energy Use	Proposed Savings	Adjusted Savings	Total Savings
		(hours)			**(#)**	**(Watts)**	**(Watts)**	**(kWh/a)**	**(#)**	**(Watts)**	**(kWh/a)**	**(kWh/a)**	**(kWh/a)**	**(kWh)**
		From site data sheet			*From site data sheet*	*From site data sheet*	*Calculated*	*Calculated*	*From site data sheet*	*From site data sheet*	*Calculated*	*Calculated*	*Calculated*	*Calculated*
Constellation Drive	Verified - Milestone 4		11/09/2015	809									54,013	120,045.38
Ti Rakau	Verified - Milestone 4		26/08/2015	825									98,316	222,831.59
5 Cross Roads	Installed	24	22/08/2016	464	183	10,972	11,795	103,040	282	3,670	32,061	93,106	86,868	110,733
		12			44	5,622	6,044	26,399	31	978	4,272			
Airport Drive Through	Installed	24	28/01/2016	670	208	12,808	13,769	120,282	283	3,695	32,280	100,784	94,031	173,079
		12			16	3,280	3,526	15,402	16	600	2,621			
Albany	Installed	24	28/01/2016	670	295	16,580	17,824	155,706	493	4,559	39,827	117,353	104,327	192,030
		12			2	500	538	2,348	2	200	874			
Andersons Bay	Installed	24	7/12/2015	722	253	13,954	15,001	131,045	431	3,518	30,733	101,038	94,268	186,983
		14			2	300	323	1,643	6	180	917			
Bank St	Installed	24	1/02/2017	301	217	11,668	12,543	109,577	279	3,009	26,287	100,908	94,147	77,853
		12			22	4,780	5,139	22,445	22	1,105	4,827			
Belmont	Installed	24	25/05/2017	188	41	3,876	4,167	36,400	41	1,635	14,283	22,117	20,635	10,658
							-	-			-			
Britomart	Installed	24	28/05/2016	549	158	9,269	9,964	87,047	259	2,533	22,128	64,919	57,713	87,045
							-	-			-			
Christchurch AP	Installed	24	3/06/2016	544	164	9,824	10,561	92,259	295	2,944	25,719	66,540	59,154	88,407
							-	-			-			
Clendon	Installed	24	21/06/2016	526	158	10,280	11,051	96,542	238	3,190	27,868	73,478	68,555	99,066
		12			25	1,466	1,576	6,884	25	476	2,079			
Dannevirke	Installed	24	29/03/2017	245	152	8,624	9,271	80,990	210	2,560	22,364	60,603	56,542	38,057
		12			11	462	497	2,169	11	44	192			
Fairy Springs	Installed	24	23/12/2016	341	134	8,085	8,691	75,928	167	2,184	19,079	64,513	60,191	56,388
		12			42	2,330	2,505	10,941	78	750	3,276			
Feilding	Installed	24	3/06/2016	544	111	6,636	7,134	62,320	162	2,063	18,022	52,297	48,793	72,922
		12			9	2,072	2,227	9,729	10	396	1,730			
Glenfield	Installed	24	12/10/2016	413	169	11,566	12,433	108,619	276	3,679	32,140	99,574	88,521	100,437
		12			27	6,030	6,482	28,314	12	1,195	5,220			
Greenlane	Installed	24	29/08/2016	457	222	16,018	17,219	150,428	310	7,263	63,450	89,460	83,466	104,791
		12			4	640	688	3,005	4	120	524			
Grey Lynn	Installed	24	2/05/2016	575	60	4,544	4,885	42,674	70	1,816	15,865	28,280	26,385	41,680
		12			11	450	484	2,113	14	147	642			
Hamilton East	Installed	24	22/04/2016	585	24	2,568	2,761	24,117	64	1,224	10,693	18,846	17,583	28,258
		12			4	1,350	1,451	6,339	4	210	917			
Hawera	Installed	18	7/11/2016	387	103	5,730	6,160	40,359	136	1,650	10,811	31,522	29,410	31,269
		7			28	1,092	1,174	2,991	25	399	1,017			
Hillmorton	Installed	24	22/06/2016	525	58	5,244	5,637	49,247	62	1,774	15,498	48,207	44,977	64,871
		12			16	3,678	3,954	17,270	18	644	2,813			
Hornby	Installed	24	23/06/2016	524	144	8,590	9,234	80,670	227	3,053	26,671	58,082	54,190	78,010
		12			15	1,062	1,142	4,987	15	207	904			
Huntly	Installed	24	10/01/2017	323	125	7,406	7,961	69,551	181	2,494	21,788	54,078	50,455	44,772
		12			22	2,062	2,217	9,682	37	771	3,368			
Kaiapoi	Installed	20	3/06/2016	544	94	9,194	9,884	71,952	124	2,499	18,193	54,583	50,926	76,109
		7			4	430	462	1,178	6	139	354			
Kamo	Installed	24	1/02/2017	301	114	6,482	6,968	60,874	156	2,139	18,686	53,168	49,605	41,020
		12			16	2,824	3,036	13,260	12	522	2,280			
Lambton Quay	Installed	24	21/06/2017	162	58	5,430	5,837	50,994	93	1,580	13,803	37,191	34,700	15,443
							-	-			-			
Levin	Installed	24	19/09/2016	436	167	9,972	10,720	93,649	241	3,168	27,676	78,052	72,823	87,227
		12			15	3,070	3,300	14,415	15	535	2,337			
Liffiton	Installed	24	7/11/2016	387	70	4,422	4,754	41,528	118	1,332	11,636	34,674	32,351	34,395
		12			36	1,372	1,475	6,442	36	380	1,660			
Lincoln Road	Installed	24	18/03/2016	620	290	18,588	19,982	174,564	400	5,072	44,309	143,544	133,927	228,117
		12			14	3,500	3,763	16,435	14	720	3,145			

*Red tag in upper right of "adjusted energy savings" cell indicates use of emergency lighting factor

Derived Ballast Factor:	7.5%	End Date	Days Open per Year	Original Fittings				LED Retrofit			Energy Savings from Retrofit		
Derived Emergency Lighting Factor:	-4.4%												
Derived Discrepancy Factor:	-6.7%	30/11/2017	364										
Store	**Progress Status**	Hours of Operation	Start Date	Days of operation	Number of Original Fittings	Pre-Ballast Load	Total Load (with Ballast)	Annual Energy Use	Number of LED Fittings	Total Load	Annual Energy Use	Proposed Savings	Adjusted Savings	Total Savings
		(hours)			**(#)**	**(Watts)**	**(Watts)**	**(kWh)**	**(#)**	**(Watts)**	**(kWh)**	**(kWh)**	**(kWh)**	**(kWh)**
		From site data sheet			*From site data sheet*	*From site data sheet*	*Calculated*	*Calculated*	*From site data sheet*	*From site data sheet*	*Calculated*	*Calculated*	*Calculated*	*Calculated*
Linwood Ave	Installed	24	21/06/2016	526	237	14,192	15,256	133,280	218	3,899	34,062	99,218	92,571	133,770
							-	-			-			
Mangere	Installed	24	28/01/2016	670	142	8,764	9,421	82,304	214	2,742	23,954	85,297	79,583	146,484
		12			33	7,056	7,585	33,132	35	1,416	6,185			
Manukau	Installed	24	2/05/2016	575	204	13,075	14,056	122,790	336	4,129	36,071	100,402	93,675	147,975
		12			14	3,500	3,763	16,435	14	630	2,752			
Manurewa	Installed	24	22/12/2015	707	170	9,246	9,939	86,831	211	2,948	25,754	65,949	61,530	119,511
		12			19	1,404	1,509	6,593	19	394	1,721			
Merivale	Installed	24	1/02/2017	301	279	15,382	16,536	144,455	389	4,584	40,046	124,418	116,082	95,991
		12			29	6,010	6,461	28,221	29	1,880	8,212			
Moorehouse Ave	Installed	24	21/06/2016	526	175	9,384	10,088	88,127	247	2,532	22,120	70,246	65,539	94,708
		12			31	1,191	1,280	5,592	31	310	1,354			
Motueka	Installed	24	25/11/2016	369	80	4,994	5,369	46,900	116	1,340	11,706	39,267	36,636	37,139
		12			25	1,248	1,342	5,860	25	409	1,787			
Nelson	Installed	24	25/11/2016	369	167	14,354	15,431	134,801	214	4,669	40,788	101,136	94,360	95,656
		12			5	1,850	1,989	8,687	8	358	1,564			
Northlands	Installed	24	22/08/2016	464	42	3,886	4,177	36,494	42	1,096	9,575	26,920	25,116	32,016
							-	-			-			
Papamoa	Installed	18	6/03/2016	632	134	7,605	8,175	53,565	222	2,483	16,269	38,740	36,144	62,756
		8			22	861	926	2,695	22	430	1,252			
Princess St	Installed	24	29/03/2016	609	182	10,120	10,879	95,039	274	2,651	23,159	75,392	70,341	117,686
		12			17	1,055	1,134	4,954	17	330	1,441			
Pukekohe	Installed	24	11/08/2016	475	159	8,513	9,151	79,947	236	2,684	23,447	62,023	57,867	75,514
		12			14	1,712	1,840	8,039	29	576	2,516			
Queenstown Frankton	Installed	24	10/03/2017	264	186	11,280	12,126	105,933	315	3,521	30,759	78,670	73,399	53,234
		12			13	1,260	1,355	5,916	13	554	2,420			
Rangatikei	Installed	24	29/03/2016	609	207	11,320	12,169	106,308	320	3,249	28,383	85,371	79,651	133,263
		12			13	2,062	2,217	9,682	19	512	2,236			
Rangiora	Installed	20	21/06/2016	526	172	8,934	9,604	69,917	239	2,435	17,727	53,702	50,104	72,403
		8			17	813	874	2,545	32	355	1,034			
Riccarton	Installed	24	21/12/2016	343	394	21,389	22,993	200,868	555	6,216	54,303	164,865	146,565	138,109
		12			32	5,780	6,214	27,141	28	2,024	8,841			
Riccarton FC	Installed	24	22/08/2016	464	1	23	25	216	1	9	79	6,752	6,300	8,031
		14			27	2,001	2,151	10,962	27	853	4,347			
Richmond	Installed	24	26/09/2016	429	71	4,684	5,035	43,988	126	1,452	12,685	35,558	33,175	39,100
		12			25	1,332	1,432	6,255	25	458	2,001			
Richmond FC	Installed	24	26/09/2016	429	2	40	43	376	2	18	157	9,985	9,316	10,979
		14			29	2,753	2,959	15,081	35	1,043	5,315			
Sydenham	Installed	24	21/06/2016	526	153	7,956	8,553	74,716	196	2,478	21,648	61,228	57,126	82,550
		12			22	2,266	2,436	10,640	30	568	2,481			
Tahunanui	Installed	24	25/11/2016	369	95	5,752	6,183	54,018	133	2,138	18,678	38,270	35,706	36,197
		12			7	810	871	3,803	7	200	874			
Taihape	Installed	24	3/06/2016	544	126	6,740	7,246	63,297	186	2,082	18,188	47,033	43,882	65,582
		12			9	542	583	2,545	9	142	620			
Taupo	Installed	24	25/11/2016	369	201	11,126	11,960	104,486	272	3,309	28,907	89,266	83,285	84,429
		12			22	3,580	3,849	16,810	22	715	3,123			
Te Ngae Road	Installed	24	15/12/2016	349	111	6,378	6,856	59,897	170	2,052	17,926	47,628	44,437	42,606
		12			18	2,056	2,210	9,654	18	915	3,997			
Te Puke	Installed	18	3/03/2016	635	96	5,708	6,136	40,204	203	2,349	15,391	26,565	24,785	43,238
		8			13	822	884	2,573	17	282	821			
The Palms	Installed	24	1/02/2017	301	1	23	25	216	1	9	79	10,554	9,847	8,143
		16			26	2,422	2,604	15,164	26	815	4,747			
The Plaza, Palm Nth	Installed	14	29/03/2016	609	48	3,172	3,410	17,377	50	1,111	5,662	11,715	10,930	18,287
							-	-			-			
Tokoroa	Installed	24	4/10/2016	421	150	7,670	8,245	72,031	219	2,078	18,153	60,859	56,781	65,673
		12			19	2,285	2,456	10,729	37	858	3,748			
Wairau Road	Installed	24	28/01/2016	670	135	9,274	9,970	87,094	197	3,091	27,003	69,864	65,183	119,981
		12			10	2,500	2,688	11,739	10	450	1,966			
Wanganui	Installed	24	7/11/2016	387	158	9,366	10,068	87,958	228	2,327	20,329	82,781	77,234	82,115
		12			15	4,050	4,354	19,017	15	885	3,866			
Westgate	Installed	24	15/12/2016	349	141	8,012	8,613	75,242	218	2,278	19,901	73,861	68,912	66,073
		12			26	5,064	5,444	23,779	26	1,204	5,259			
Total								**5,127,675**			**1,437,222**			**4,841,693**

*Red tag in upper right of “adjusted energy savings” cell indicates use of emergency lighting factor

APPENDIX B- LIGHT LEVEL SURVEYS

SITE	AREA	LIGHT LEVELS (LUX)	COMPARISON TO MILESTONE 4 (M4)
Glenfield	Basement; end storage	250, 400	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau
	Basement; lockers	240	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau
	Basement; drinks	500	No equivalent in M4, but greater than to BOH corridor, freezer and roof ladder at Ti Rakau
	Basement; hallway	200	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau
	Basement; storage	350, 370, 50, 70 (lower values at ends of aisles)	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau (excluding ends of aisles)
	Basement; entrance	320, 280, 380	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau
	Washup	580	Greater than M4 kitchen baselines
	Kitchen	1220, 1350, 1380	Greater than M4 kitchen baselines
	Office	830, 850	Greater than M4 office baselines
	Desk	590	Greater than M4 office baselines
	Behind Counter	1000, 1150	Greater than M4 office baselines
	In front of Main Counter	230, 290, 480	Similar to M4 entry baselines
	Tables	150, 170, 240, 520, 830 (higher levels near windows)	Similar to M4 dining baselines range
	Downstairs tables	210, 300	Similar to M4 dining baselines range
	Back party room	**120, 180**	**Less than M4 party room baselines**
	Front party room	**180, 190**	**Less than M4 party room baselines**
Grey Lynn	Storage	220 to >350	No equivalent in M4, but similar to BOH corridor, freezer and roof ladder at Ti Rakau
	Kitchen	700	Greater than M4 kitchen baselines
	Counter	1800	Greater than M4 counter baselines
	Tables	600 (higher levels near windows)	Higher end of M4 dining baseline range

SITE	AREA	LIGHT LEVELS (LUX)	COMPARISON TO MILESTONE 4 (M4)
Britomart	**Loading Dock / Rubbish Area**	**160, 215, 230, 170**	**No equivalent in M4, but less than BOH corridor, freezer and roof ladder at Ti Rakau**
	Kitchen	680, 416, 350, 740, 720	Greater than M4 kitchen baselines
	In front of Main Counter	330, 300, 375	Similar to M4 entry baselines
	Tables	170, 260, 280, 160, 165, 320 (higher levels near windows)	Similar range to low-end of M4 dining baseline range