

## **EXECUTIVE SUMMARY**

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Over 10,000 cobra style streetlights were replaced with light emitting diode (LED) fixtures, in the project completed in 2018. Energy savings of \$900,000 per year have been realized from this change. Also due to the longevity and reliability of LED light sources, maintenance resources have been freed up to focus much needed attention on the aging streetlight pole infrastructure.

At the time of the initial project there was no economically attractive solution to convert the 2,945 decorative and post-top fixtures. With research and testing, solutions have been found.

Over a period of four years all the remaining high-pressure sodium (HPS) fixtures will be replaced or retrofitted with an LED bulb. The combination of replacement and retrofit provides the most benefit with the shortest payback.

The total cost of the project is \$1,157,470, upon completion of the project there will be estimated energy savings of \$171,000 per year, based on current electricity charges. With the expected increase in energy costs and the fact the project will take place over 4 years, a combined pay-back period of 7.8 years will be realized.

Upon completion in 2024, all streetlights in the City of Kelowna would feature LED technology, supporting Council's priority to decrease greenhouse gas emissions and provide a combined saving of over \$1,000,000 per year in electricity costs.

## **INTRODUCTION**

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The objective of this project is to complete the replacement/retrofit of the remaining 2,945 high pressure sodium (HPS) streetlights to light emitting diode (LED) technology.

The work will be carried out over four years as part of the ongoing maintenance contract.

Total project cost - \$ 1,157,470

At completion of the project, energy costs will be reduced from \$255,000 to \$84,000 per year, a saving of \$171,000 (at today's electricity rate, compounding at 2.5% per year).

## **STATEMENT OF THE PROBLEM**

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There are 2,945 streetlights still running old and inefficient HPS lamps. As such we are losing \$171,000 in energy savings.

HPS lamps have a service life of 5 years as opposed to 15-20 years for LED, the extra maintenance time required is taking away from maintaining other assets in the City's inventory, such as replacement of ageing streetlight poles.

GHG emissions for these assets are not being reduced.

## ANALYSIS

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Quantitative Analysis	Status Quo	Replace all fixtures	Combination of head and lamp replacement
BENEFITS:			
Energy Savings (per year)			
Sub-total	\$-	\$171,000.00	\$171,000.00
			*See note below
COSTS:			
Capital and One Time:			
Year 1		\$3,538,015.00	\$316,192.50
Year 2			\$316,192.50
Year 3			\$292,560.00
Year 4			\$232,525.00
Sub-total	\$-	\$3,538,015.00	\$1,157,470.00
PAY-BACK PERIOD (Years)			
		20.70	7.80
			*See note below

Qualitative Analysis	Status Quo	Replace all fixtures	Combination of head and lamp replacement
BENEFITS:			
Benefit 1	No capital cost	All new fixtures	Economically viable
Benefit 2		Lighting improved	Lighting improved
Benefit 3		Energy savings	Energy savings
COSTS:			
Cost 1	No energy savings	\$3,538,015.00	\$1,157,470.00
Cost 2	Increased maintenance costs	Very long payback	Short payback

\*The savings start at \$171,000 but will compound based on electricity costs increasing by 2.5% per year. As a four-year project is proposed, the savings have been adjusted accordingly giving the payback period is 7.8

## DISCUSSION OF POSSIBLE OPTIONS

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**Status quo** – The lights could be left operating with the HPS lamps. The energy savings of \$171,000 would be lost, and with a service life of 5 years, the maintenance time required would take away from maintaining other assets in

the City's inventory, such as replacing ageing streetlight poles. GHG emissions for these assets would also not be reduced.

**Replace all the fixtures completely** - Replacing the 1,723 decorative fixtures as well as the 1,222 post-top fixtures is very expensive. To replace each decorative head would cost approximately \$1200-1500 dollars. In this scenario, project costs would not be recouped for 25-35 years.

**Combination head and lamp replacement (best solution)** – Using a combination of lamp replacements for the decorative fixtures and fixture replacements for the post-tops realizes the full energy saving of \$171,000 per year, reduces GHG emissions and gives a more economically attractive pay-back period of 7.8 years.

## **RECOMMENDATION**

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Using a combination of lamp replacements for the decorative fixtures and fixture replacements for the post-tops realizes the full energy saving of \$171,000 per year, reduces GHG emissions and gives a more economically attractive pay-back period of 7.8 years.

## **DETAILS OF YOUR CHOSEN OPTION**

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The plan is to complete the project in four phases with one phase completed per year.

This model has been chosen for the following reasons:

It will allow the work to be carried out by the chosen maintenance contractor in place at that time, as part of their normal contracted work.

The first two years will see the post-top fixtures retrofitted to the same known fixtures successfully used in the previous streetlight project. LED technology is continually improving and in the first two years technology may emerge that will provide an even more attractive solution for the decorative fixture retrofit, slated for phases 3 and 4.

### **Phases 1 and 2**

Over the first two years 1,222 Pinto style heads (pictured left), will be replaced with Cobra style fixtures (pictured right).

The Cobra style is the same fixture as the 10,000 that were replaced in the LED retrofit carried out in 2018.

The fixtures are more cost effective than replacement with a similar Pinto style head and will provide improved levels and quality of light. These beneficial increases make fixture replacement a more desirable option than lamp replacement.

Pinto Style



Cobra style



### Phase 3 and 4

In years three and four, 966 Acorn, 666 Harbour and 97 Aurora style fixtures, as shown respectively, would be retrofitted to accept an LED lamp.

The fixture housings would remain the same.

Acorn style



Harbour style



Aurora sty



## CONCLUSION

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Over a period of four years all the remaining HPS fixtures will be replaced or retrofitted with an LED bulb. The combination of replacement and retrofit provides the most benefit with the shortest payback.

Looked at as 4 separate phases the individual payback periods are.

Year 1 - Replacement of 611 Pinto heads fixtures – 7.3 years

Year 2 - Replacement of 611 Pinto heads fixtures – 7.3 years

Year 3 - Replacement of 966 Aurora with LED lamps – 5.2 years

Year 4 - Replacement of 666 Harbour and 97 Aurora with LED lamps – 5.1 years

The reason for the longer payback fixtures being replaced first is that they will provide the greatest increase in light levels, light quality and benefit for public safety.

The total cost of the project is \$1,157,470, with energy savings of \$171,000 per year, based on current electricity charges. With the expected increase in energy costs and the fact the project will take place over 4 years, a combined pay-back period of 7.8 years is realized.

Upon completion, all streetlights in the City of Kelowna by 2025 would feature LED technology, supporting Council's priority to decrease greenhouse gas emissions and provide a combined saving of over \$1,000,000 per year in electricity costs.