



## Project Case Study

**CARLSBAD CAVERNS NATIONAL PARK**  
Wireless colour temperature tunable lighting system

# Carlsbad Caverns National Park



**Specifier:** RMH Group Consulting Engineers (Denver Colorado)  
**Customer:** US National Parks Service (Denver Colorado)  
**Contractor:** Tudor Perini (New York)

## Project Overview

With a lighting system more than 30 years old, much of which had not operated in years, the National Parks Service, with the help of RMH Group Consulting Engineers in Colorado, sought a long-term and energy efficient solution that could withstand the alkaline, very corrosive, constantly humid environment over an expected operating life of 25+ years.

With a very keen focus on the environmental impact and long term serviceability, the project took approximately seven years from conception to completion. The selection process was very rigorous with a panel made up of US National Parks Service staff and external consultants.

## About the Carlsbad Caverns

In the Chihuahuan Desert of New Mexico, 380km Southeast of Albuquerque lies the Carlsbad Caverns, one of the largest publicly accessible cavern systems in the world.

Hidden beneath the surface are more than 119 known rooms, spreading over the area of 189km<sup>2</sup> with over 6.5km of limestone caves.

Developed over the period 250 millions of years this amazing site is listed as UNESCO World Heritage Site and it is a home to many species, including 17 species of bats.

Discovered in 1898 by a young Jim White, the Carlsbad Caverns hosts in excess of 400,000 visitors each year, and is classified a UNESCO World Heritage site.

## Considerations

The previous lighting scheme relied heavily on fluorescent and halogen lamps, introducing the environmental and energy consumption problems inherent in those products.

Over the years, many of the luminaires had stopped working and were 'lost', meaning that so too were those features of the cave being lit. For such a sensitive, important location so many different factors required consideration, beyond just lighting quality and durability.

An ongoing problem and unintended side effect of fluorescent lamp use was the promotion of algae growth; a problem the National Parks Service was very keen to mitigate with the new LED system.

Other environmental considerations included ensuring the high frequency sources used in the electronics of an LED based solution would not interfere with bat flight and navigation.

Another critical performance requirement was the ability to check if a luminaire is functioning correctly, without having to leave the trail. Every time a ranger has to walk across the cave surface to check a luminaire or change a lamp, that surface is damaged. The new lighting system had to solve this problem, provide solutions to the other critical performance requirements, and be capable of sustained operation for 25+ years.

## The Solution

When the design team approached Lumascope, we were very well known for producing stainless steel, precision engineered luminaires suitable for extreme conditions. As discussions progressed and after several site tests, Lumascope also proved capable of providing the complete lighting and controls package that met the rigorous performance requirements of the site.



The illumination solution came in the form of three different luminaires:

1. Form factors, featuring tunable white light engines, glare shields and bases to allow placement on uneven surfaces.
2. The use of different color temperatures is a significant aid for visitors to experience the grandeur and scale of these underground spaces. Gauging distance and depth perception in the caverns it is very difficult to judge, however the use of different color temperatures greatly assists, providing an enhanced experience for visitors.
3. The control solution is wireless-based, allowing for remote commissioning and maintenance reporting via a portable, wireless control terminal (without interference to the bat population) and custom software developed specifically for the project. Each fixture is individually addressable and controllable. When the control terminal is not in use, there is no wireless signal transmission, making it perfect for the bat population. Rangers do not operate the wireless system during those key times of the year and specific times of day when the bats are in flight. Rangers can now perform routine status checks of the luminaires without having to leave the trail, ensuring the longevity of the cave floor as an undisturbed surface.

### The Outcome

While the rangers appreciated the new system for its efficiencies, in both management and energy savings, visitors and rangers alike are amazed at the aesthetic difference the new lighting has made. Long-time park personnel are now seeing areas and features of the caves never before seen.

Lumascape is proud to be part of such an important project for one the United States' most beloved and visited parks. Lumascape was very pleased to be chosen as the turnkey luminaire and controls solution provider for this historic project.



LS391LED-SR406 (25W)



LS931LED-SR406 (25W)



LS331LED-SR406 (6W)

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### ASIA PACIFIC

Brisbane Technology Park  
18 Brandl Street  
Eight Mile Plains, QLD 4113  
Australia  
P: +61 7 3854 5000  
F: +61 7 3854 5001  
E: sales@lumascape.com

### NORTH AMERICA

1300 Industrial Road, Unit #19  
San Carlos, CA 94070  
United States of America  
P: +1 650 595 5862  
E: info@lumascape.com

### CHINA

20 West Building, No 377 Wuyi Road  
Wujin Hi-Tech Zone  
Changzhou, Jiangsu, China  
P: +86 519 8919 2555  
F: +86 519 8919 1053  
E: chinasales@lumascape.com

### MIDDLE EAST

Dubai World Centre  
Building Block C, Office #432  
Dubai  
United Arab Emirates  
P: +971 4 887 9951  
F: +971 4 887 9601  
E: sales@lumascapeme.ae

[WWW.LUMASCAPE.COM](http://WWW.LUMASCAPE.COM)

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