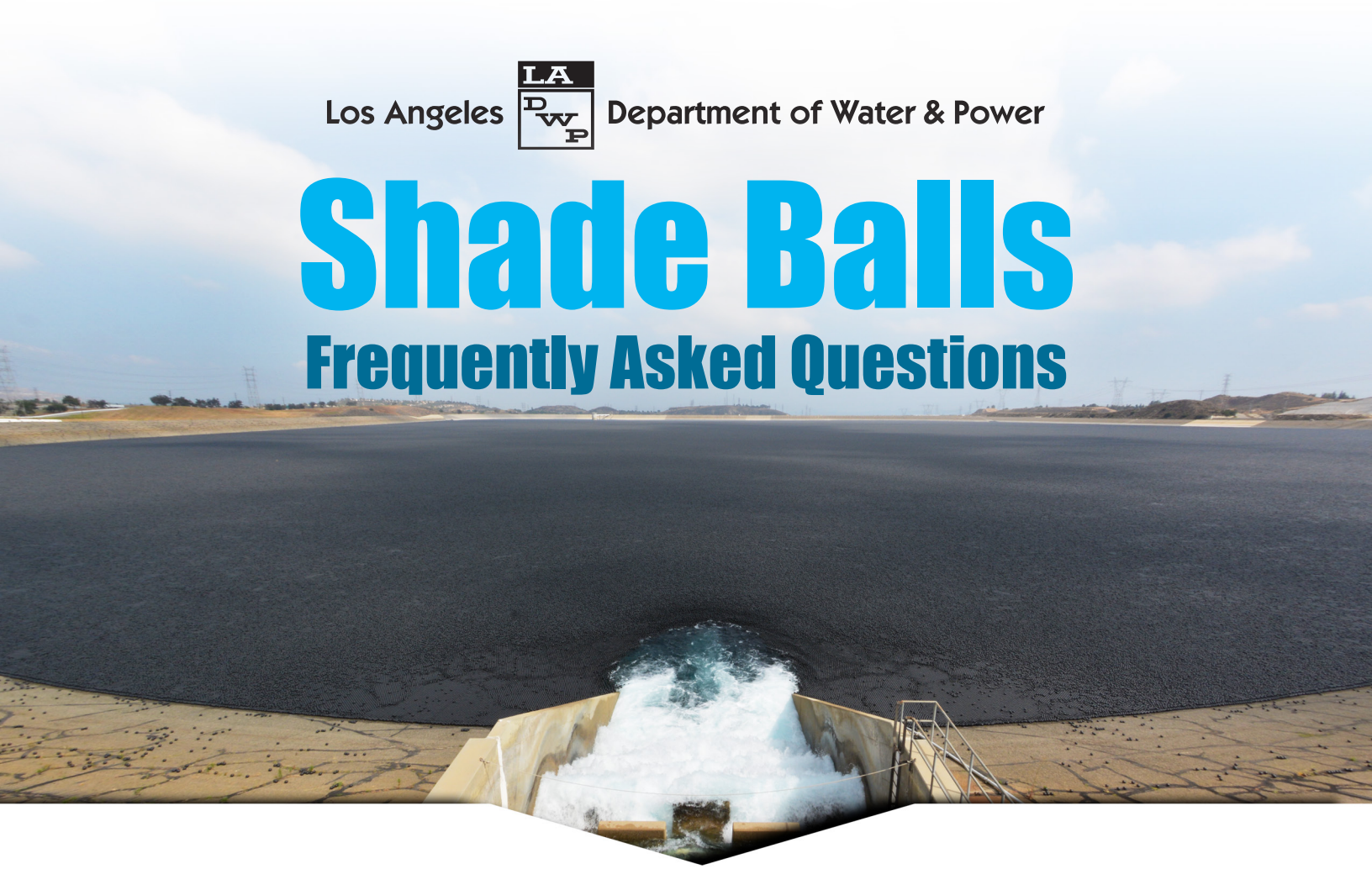
Los Angeles Department of Water & Power

Shade Balls

Frequently Asked Questions



WHAT IS THE PRIMARY PURPOSE OF DEPLOYING SHADE BALLS ON THE SURFACE OF LA'S RESERVOIRS?

The small, black plastic balls protect water quality by preventing sunlight-triggered chemical reactions. A cost-effective investment that helps bring the Los Angeles Reservoir into compliance with federal water quality mandates, the shade balls are expected to save $250 million when compared to the number and magnitude of alternate projects and solutions considered to meet that goal. Those alternatives included splitting the reservoir into two with a bisecting dam; and installing two floating covers that would have cost more than $300 million. On the contrary, each shade ball was placed at a cost of 36 cents, making the total cost of the Los Angeles Aqueduct project approximately $34.5 million. The shade balls will also prevent the annual loss to evaporation of about 300 million gallons of water.

IS IT SAFE FOR SHADE BALLS TO BE IN CONTACT WITH DRINKING WATER?

The plastic used to make shade balls is food grade and brings no known issues for health and safety. As a matter of fact, the same plastic is used for water pipes worldwide. The shade ball material and production process have been certified by NSF International. The balls comply with federal standards and are considered safe to be in contact with drinking water.

WHEN DID DWP FIRST INITIATE THIS STRATEGY?

Dr. Brian White, a now-retired LADWP biologist, was the first person to think of using shade balls for water quality. The idea came to him when he learned about the application of "bird balls" in ponds along airfield runways. The innovative, in-house solution has been used in LADWP's open-air reservoirs since 2008 to block sunlight, prevent chemical reactions and curtail algae blooms. Currently in place at Upper Stone, Elysian and Ivanhoe reservoirs, the shade balls come with the added benefit of reducing evaporation off the reservoir surfaces by 85 to 90 percent.

HAS THIS PROVEN EFFECTIVE AT OTHER RESERVOIRS?

The shade balls have effectively controlled the formation of sun-triggered algae and bromates in all deployed reservoirs along with the added benefits of avoided chemical and tactical operational costs. Shade balls where placed on Ivanhoe Reservoir in September 2008, Elysian Reservoir in February 2009 and Upper Stone Canyon Reservoir in April 2012.

FROM WHAT MATERIALS ARE THE SHADE BALLS CONSTRUCTED?

Shade balls are made of high density polyethylene (HDPE) resin with a black colorant that inhibits ultra-violet light degradation. All shade balls have a 4-inch outer diameter. The balls used on the Los Angeles Reservoir weigh 40 grams and are filled with 200 grams of drinking water to give them weight so they are not blown

away by wind gusts, as the reservoir is located in a high gust area. Shade balls in place at other LA reservoirs - Elysian, Ivanhoe and Upper Stone Canyon - are hollow and not filled with water.

WHY ARE THE BALLS BLACK? WOULDN'T LIGHTER COLORS BE BETTER AT DEFLECTING HEAT?

The balls are black because they have "carbon black" in them as a UV stabilizing agent, which gives them their lifespan. Other colors such as white were considered, but not selected because they contained dyes that could leach into the water. A blue shade that is food grade and not a potential contaminant was considered. However, the manufacturers were not sure the balls would last longer than a year in the sun. The black balls have proven to survive outdoors and are approved for drinking water contact. According to the NSF International, which tested and certified the balls for contact with drinking water, the carbon black does indeed make the plastic more thermally, structurally, and chemically stable and resistant to UV degradation.

DOESN'T THIS EXACERBATE THE HEAT ISLAND EFFECT AND/OR CREATE A BACTERIA BREEDING GROUND?

We have found no significant or abnormal heat effects on the water. It is our observation that although the top surface of the shade balls absorb heat, the heat is not well conducted (plastic is a poor conductor) down to the water surface and the air. Rather, the shade balls act as a 4-inch insulation blanket since the 96 million balls cover the surface of the Los Angeles Reservoir. The reservoir itself, since it is such a deep pool of relatively cool water, helps to keep itself thermally stable at the surface.

WERE BALLS MADE IN OTHER COLORS CONSIDERED?

Yes. LADWP worked with the manufacturers to consider other colors including blue. However, the lack of UV stabilizers and inhibitors in the color resins that were tested did not hold up well to sunlight and the balls would have degraded within one to five years. Other colors would not totally block UV light and would have required dyes, which do leach into the water. The carbon black does not emit or leach any chemicals.

The balls containing the carbon black blocked out sunlight more effectively and resisted degradation longer. The black shade balls had also been certified to be safe to be in contact with drinking water by NSF International.

ARE THE BALLS MADE OF RECYCLED CONTENT?

No. Only new high density polyethylene is used. The balls are completely recyclable.

ARE THE BALLS RECYCLABLE? WHAT IS THE CITY'S PLAN TO DISPOSE OF/RECYCLE THE BALLS AFTER USE?

Yes. Ideas for reuse or repurposing will be considered before sending them off for recycling once they are no longer needed.

WILL THE SUN AND HEAT DEGRADE THE SHADE BALLS INTO MICRO-PLASTICS THAT WILL END UP IN DRINKING WATER?

Since initiating this method in 2008, LADWP has seen no evidence that shade balls have degraded into "micro-plastics." Reservoir water is sampled extensively throughout the system and no plastic pieces or chemical leaching from the shade balls have been detected.

WILL THE PLASTIC LEACH ENDOCRINE DISRUPTORS OR CAUSE BACTERIAL CONTAMINATION IN LA'S DRINKING WATER?

LADWP tests for over 100 compounds and has found no levels of concern among results. Testing began before the shade balls were delivered with certification leach testing by the NSF International to meet its rigorous NSF Standard-61 requirements for any materials in contact with drinking water. This testing has continued with our own regular quarterly testing of the reservoir and distribution water for bacteria and chemical compounds since 2008. If continued testing indicates a problem in the future, DWP will be able to detect it and respond immediately.

LADWP's daily water quality monitoring and maintenance operations have found neither abnormal thermal effects nor bacterial breeding in the reservoirs as a result of the use of shade balls. To address concerns about possible bacterial reactions, LADWP implements disinfectants of the water after filtration, and again after it leaves the reservoir. Our water quality monitoring is vigorous and we constantly track for any abnormalities.

The plastic is food grade and brings no known issues for health and safety. As a matter of fact, LADWP uses the same plastic for water pipes, and they too are authorized for safe usage by the appropriate nationally recognized authorities. Furthermore, LADWP has tested the water for this type of plastic for the following endocrine disruptor compounds and chemicals, and none were detected:

1. Alachlor
2. Atrazine
3. Benzo(a)pyrene
4. Benzylbutylphthalate
5. Di(2-ethylhexyl)adipate
6. Di(2-ethylhexyl)phthalate
7. Di-n-butylphthalate
8. Di-n-octylphthalate
9. Diethylphthalate
10. Dimethylphthalate
11. Molinate
12. Simazine
13. Thiobencarb
14. Pentachlorophenol
15. Phenol
16. Cadmium
17. Chloroform
18. Dibromochloropropane(DBCP)
19. Dibromomethane
20. Bisphenol-A
21. Mercury
22. Organic solvents
23. Disinfection Byproducts [byproducts are present but not due to plastic]
24. Pesticides
25. Refrigerant
26. Biocide
27. Heavy Metals
28. Organics in plastic production
29. Fire/Flame retardants
30. Organics in PVC production
31. Organics in production of dyes
32. Gasoline additives

WHAT TYPE OF WATER QUALITY ISSUES DO SHADE BALLS PROTECT AGAINST?

Due to the drought, the City is relying on greater quantities of water from the California Aqueduct, which is high in bromide, particularly in dry years. The problem is that a chemical reaction can occur when chlorinated water containing high levels of bromide is exposed to sunlight, creating bromate, a suspected carcinogen. Bromate is a regulated drinking water contaminant that is a known disinfection byproduct of ozonation treatment, but its formation in open bodies of water was not expected. The shade balls significantly reduce sunlight exposure, preventing that chemical reaction and protecting our water supply from contamination.

Uncovered reservoirs, like Los Angeles Reservoir are prone to algae formation due to sunlight exposure, which requires chlorine for treatment. The algae break down over time, turning into organic matter that reacts with chlorine to form disinfection by-products (DBP) that must be minimized under water quality regulations set by the EPA and State Department of Health. The goal at these reservoirs is to reduce sunlight exposure in order to reduce algae and chlorine use and thereby reducing the formation of DBPs.

HOW DO SHADE BALLS REDUCE THE AMOUNT OF CHLORINE USED IN TREATING WATER?

Chlorine is used to treat algae growth. The use of shade balls greatly reduces the amount of algae growth in reservoirs due to blocked sunlight exposure, thereby reducing the daily chlorine requirement at the Los Angeles Reservoir which have resulted in a savings of nearly $28,000 a month, given current costs of chlorine. More importantly, the reduction in the amount of chlorine deliveries has resulted in improved safety conditions for employees and nearby residents.

WHAT TYPE OF GOVERNMENTAL WATER QUALITY REGULATIONS DO THE SHADE BALLS FULFILL?

For Los Angeles Reservoir, shade balls in concert with UV treatment and operational modifications to the water distribution system will allow LADWP to comply with state and federal water quality regulations from the California Department of Drinking Water (DDW) and the United States Environmental Protection Agency (US EPA). These regulations include the Safe Drinking Water Act, US EPA's Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBP Rule).

IS THE LADWP THE FIRST TO USE SHADE BALLS?

No. Plastic balls have been around for many decades and have had a variety of applications in other fields. Most notably they have been used at or near airports to minimize bird strikes and in the mining industry to control evaporative water loss. However, LADWP is the first utility to use shade balls to mitigate water quality issues in drinking water.

WHAT IS THE LIFE SPAN OF THE SHADE BALLS?

The balls have a service life of at least 10 years. The shade balls will eventually lose structural integrity and may split in half or fail at the seams after a decade at which point they will be removed and fully recycled.

WILL THE BALLS ALLOW A LOCATION FOR ADDITIONAL BACTERIA TO GROW AND ENTER THE WATER SUPPLY?

LADWP provides filtration and disinfection of the water before and again after it leaves the reservoir. Our water quality monitoring is vigorous and we constantly test the water at each step of the treatment process and during distribution for abnormalities. Today, LA's drinking water consistently meets or is better than all drinking water standards for water quality.

"Certification to NSF/ANSI Standard 61 - Drinking Water System Components-Health Effects, demonstrates that products do not contribute harmful levels of contaminants to drinking water," said David Purkiss, General Manager, Water Systems, NSF International. "Products that are in contact with drinking water are required to be certified to NSF/ANSI 61 by the State of California as well as most other US States and Canadian Provinces."

DO SHADE BALLS HELP CONSERVE WATER THAT WOULD OTHERWISE BE LOST TO EVAPORATION? IF SO, HOW MUCH?

Shade balls contribute to reducing the effects of evaporation by reducing the water surface area exposed to the sun, and by reducing the flow of wind above the water surface. It is estimated that up to 90 percent of water that would be lost due to evaporation could be saved when the reservoir is fully covered with shade balls.

WHAT ELSE IS LADWP DOING TO CONSERVE WATER?

The City of Los Angeles is a leader in water conservation efforts. Over the past 40 years, Los Angeles' per capita water usage has remained flat – despite a population increase of over 1 million people.

This year alone, Los Angeles has led the charge and already cut our city's water usage by 13 percent. Thanks to an executive directive from Mayor Garcetti, LADWP is on track to make further reductions to usage that will allow us to reduce purchased water imports 50 percent by 2025.

WHY ARE THE BALLS WATER-FILLED?

Shade balls at the Los Angeles Reservoir are partially water-filled to weigh them down to counteract the force of the winds that tends to push aside the shade balls and expose the surface to sunlight.

ARE THE SHADE BALLS PERMANENT?

At Elysian, Ivanhoe and Upper Stone Canyon Reservoirs, the shade balls are temporary. At Ivanhoe, the shade balls will be removed when Headworks Reservoir East is complete and fully operational. Shade balls on Elysian and Upper Stone Canyon Reservoirs will be removed as floating covers are installed. At Los Angeles Reservoir, the shade ball solution is permanent. They will be removed, recycled and replaced every 10 years.

HOW MANY BALLS ARE NEEDED AT THE LA RESERVOIR?

Three million air-filled balls were deployed at both Ivanhoe and Elysian Reservoirs. At Upper Stone Canyon, 6.4 million air-filled balls were deployed. At LA Reservoir, 96 million water-filled balls were deployed.

DID LADWP CONSIDER ALTERNATIVES TO SHADE BALLS IN LA RESERVOIR?

Shade balls were an alternative to the original solution planned at LA Reservoir to meet federal water quality requirements. The original plan was a multi-faceted solution that included splitting the existing reservoir in two by building a division dam, constructing new inlet and outlet works, and installing two of the world's largest floating covers over each half. LADWP also would have had to construct a new reservoir to handle the operational needs while LA Reservoir was out of service. This project would have been a major undertaking and very expensive. Early estimates of such a project were at least $300 million.

In conjunction with the shade ball effort, LADWP will build a second, $100 million ultra-violet treatment facility to further treat LA Reservoir water, allowing the Department to meet its regulatory timeline for compliance with the Long Term 2 Enhanced Surface Water Treatment Rules, save more than $250 million in capital improvement costs, and reduce water losses.

WHAT COMPANY FABRICATES THE SHADE BALLS?

Two vendors provided shade balls for Los Angeles Reservoir. The primary vendor was Artisan Screen Printing, a small minority-owned blow-molding business based in Azusa. They provided 89.6 million balls. The second vendor was XavierC, a small woman-owned broker out of Glendora providing balls manufactured by Microdyne Plastics out of Colton. They provided 6.4 million balls.