AGENDA NO. ___

WEST BASIN MUNICIPAL WATER DISTRICT

NOVEMBER 6, 2002 – Water Resources
McDonald, Kwan
NOVEMBER 25, 2002 – Board Meeting
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CONSENT CALENDAR

WATER QUALITY UPDATE - THE CYCLE OF RAINFALL

SUMMARY:

Now that it's November, the rainy season is officially here, which typically lasts until March and as we know here in Southern California, that can mean a number of things. Southern California typically averages about 15 inches of rainfall per year, and has been averaging such for the past 30 years. Data accumulated by the Los Angeles County Department of Public Works illustrates that in the Los Angeles coastal plains this 15 inches is indeed average. However, moving into the San Gabriel Mountains just outside of the Los Angeles area, average rainfall here nearly doubles. Historical data also shows that rainfall patterns generally exhibit average to wet years alternating between dry years. From 1994 to 2000, Southern California enjoyed average to wet rain conditions, followed by dry years from 2000 to 2002. In fact, the 2001 to 2002 water year was the driest rainfall season ever recorded in history in Los Angeles with less than five inches of rain.

Fortunately, the Department of Water Resources (DWR) foresees some promise with this year's rainy season, even though the El Niño conditions are currently weak to moderate. El Niño conditions are strong enough though for the DWR to predict an increased chance of above-average precipitation in Southern California.

No matter how much rain falls though, Southern California relies on stormwater to ultimately replenish our local groundwater basins and drinking water sources. There is no doubt how important rainfall is to our survival in Southern California, but do we really understand the process by which a rainstorm is even generated?

How does rain form?

Rain forms from a combined process of evaporation and condensation. As the sun warms surface water from lakes, rivers, or oceans, water drops are evaporated into water vapor. This water vapor travels into the sky, becoming "water in the air" and the basis for cloud formation. The water vapor then condenses around tiny particles of dust, smoke, or salt crystals, becoming tiny droplets. These droplets are usually only 0.0001 to 0.005 centimeters in diameter.

These tiny droplets then band together with the smaller particles adhering to the larger particles, creating bigger and bigger drops. Eventually, the weight of these drops is too heavy for the cloud to contain anymore and they start falling, continuing to pick up additional smaller droplets on the way down. Once the combined drops reach 0.5 millimeters in diameter they are classified as a raindrop; droplets that remain less than 0.5 millimeters in diameter are classified as "drizzle". Raindrops over 4 or 5 millimeters in diameter eventually split into separate drops.

As the raindrops make their way to earth, they arrive in various sizes due to the rate and volume of droplets that they combined with on the way down. Also, the original particle the water vapor adhered to forms a basis for the size of each drop with each one a different size.

What does a raindrop look like?

Although culture has generally accepted the presentation that raindrops are shaped like a teardrop, this is not true. Raindrops less than 2 millimeters in diameter tend to be spherical shaped, and those over 2 millimeters are shaped more like a hamburger bun with a flat bottom and a rounded top. Larger raindrops (4-5 millimeters in diameter) on the verge of breaking into smaller raindrops resemble a parachute with a tube of water around the base.

These shapes are governed by the surface tension of the water and the air pressure pushing up against the bottom of the raindrop as its falling. Smaller raindrops are controlled by surface tensions, hence the spherical size. As raindrops increase in size however, they travel faster, and the air pressure from underneath causes the raindrops to flatten on the bottom even causing a depression. Eventually, the depression gets so big that it pushes up through the raindrop, leading to a split into smaller raindrops.

How fast do raindrops travel?

The heavier a raindrop, the faster it falls toward earth. Raindrops approaching 5 millimeters in diameter can fall about 20 miles per hour. The minimum size for a raindrop, 0.5 millimeters in diameter, only falls at about 5 miles per hour. Of course, during flight toward earth, there is gravity, air drag, updrafts, downdrafts, and other items which can affect the speed of a raindrops descent.

Where does the rainwater go?

Once in contact with the ground, rainwater infiltrates into the ground, becomes runoff, or evaporates back into the atmosphere. These options depend on the rate of rainfall, land topography, soil and vegetation conditions, amount of urbanization, etc. For example, in Los Angeles County, the land surface is 4,060 square miles. A one-inch rainstorm over this land area accumulates approximately 70 billion gallons or about 214,820 acre-feet of rainwater. However, due to the large amount of impervious areas in Los Angeles County, most of this water probably becomes runoff.

Importance of rain

Rain is an important necessity for our drinking water supplies here in Southern California, without it, our drinking water sources are limited. The Los Angeles County Department of Public Works knows this as well, diverting approximately 81,060 acre-feet (over 26 billion gallons) of stormwater runoff into the Montebello Forebay Water Conservation System spreading grounds during the 2001-02 rain season. This stormwater eventually percolates back into the water table.

This illustrates just how valuable rain is to the water cycle, which continuously cycles water back and forth between liquid water, water vapor, and ice. Rain also irrigates our plants and provides water to wild animals. With pollution leading to acid rain, and excessive dust in desert/arid regions actually stifling rain production, it is imperative that we not take our rain for granted and respect the water cycle that it is a part of.

FISCAL IMPACTS:

None.

ENVIRONMENTAL COMPLIANCE:

Not applicable.

COMMITTEE STATUS:

This item was reviewed by the Water Resources Committee on November 6, 2002 and agendized to the November 25, 2002 Board meeting Consent Calendar.

RECOMMENDED MOTION:

This item is for information only.

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