AGOURA HILLS TRIAL NO. 1 With Updates to December 30, 2008

WATER SAVINGS PROGRESS REPORT DUE TO MODIFICATION OF SPRINKLER HEADS WITH "LITTLE VALVES" IN MEDIAN STRIP ON KANAN RD, AGOURA HILLS, CALIFORNIA

The subject median strip is located on Thousand Oaks Boulevard running easterly from Kanan Road, the main north-south street in the City of Agoura Hills. Thousand Oaks Boulevard runs parallel to the 101 Freeway and is located less than one mile north of the freeway.

The median island would normally be characterized as having a length of one city block. It is 10 feet wide and irrigated by four remote control valves (RCV) with approximately 27 heads per RCV. Starting from the intersection of Kanan Road and Thousand Oak Boulevard and heading east on Thousand Oak Boulevard the first and third landscape areas are each planted with 1,320 sq ft of turf (RCV #3 & #4). The second and fourth landscape areas are each 1,250 sq ft and planted with shrubs and trees (RCV #1 & #2). All four landscape areas contain small to midsize trees.

The existing median irrigation system on Kanan Road and on Thousand Oaks Blvd, east of Kanan is controlled and monitored by a Cal-Sense central irrigation control system with a master flow control valve, operates with a static water pressure of 80 psi, and is irrigated with 6" Rain Bird pop-up sprinklers that are in excess of 12-15 years old. The heads are triangularly spaced and carry 8' and 10' Rain Bird nozzles. The City of Agoura Hills has maintained water usage records for at least four years. The initial programmed irrigation frequency was four times per week with a runtime of 12 minutes for both RCV #3 & #4.

RCV #3 was chosen for the trial. Although the 8' and 10' nozzles are the normally recommended size nozzles for a 10' wide median strip, the overspray and excessive misting from the sprinklers constantly saturated the street on both sides of the median strip each time the irrigation system turned on.

The proposal was to replace the existing Rain Bird 6" pop-up riser stems with the Valvette Systems 'LittleValve' 6" replacement pop-up stems for the existing 27 Rain Bird 6" pop-up sprinklers. The LittleValve 6" pop-up stem is designed to be interchangeable with Rain Bird's model 1806 pop-up sprinklers. However, it was found that the existing Rain Bird 6" pop-up heads were too old, hence the City of Agoura Hills was required to swap out the old Rain Bird sprinklers for Valvette System's new 6" pop-up sprinklers known as "Little Tuffy" (Model No. TUF6,) which has the LittleValve built-in.

The change-out was performed on Friday, March 7, 2008, by the Landscape Maintenance Contractor, Quality Landscape Co. The new "Little Tuffy" sprinkler heads were equipped with Rain Bird 15 foot nozzles.

Within days of the irrigation retro-fit on RCV #3, the following was observed and confirmed:

1) All misting (fogging) and most over-spraying was eliminated, thereby minimizing one major potential cause for roadway deterioration.

2) Due to increased water uniformity, the overall water usage was reduced by 50.7% without any noticeable effect on the viability of the turf.

Schedule #1

Valve	date	# of days irrigated	runtime	aver. water usage/day	% of water saved/day	gal/min used
#4	3/10-19	04	12 min	624 gal		52.9 gal
#3	3/10-19	04	12 min	308 gal		25.6 gal
Difference ----------				**316 gal**	**50.7%**	**27.3 gal**

Substantial testing was previously conducted on LittleValve sprinkler parts in 2004 by Joe Kissinger, water auditor, in collaboration with the eminent Dr. Joseph Hung, professor emeritus at Cal-Poly, Pomona that validated higher water uniformity when this product was used (see SPRINKLER PERFORMANCE COMPARISON STUDY, April 2004, by Hung & Kissinger)

In order to confirm that higher uniformity of the water application occurs due to the presence of the LittleValve in the pop-up riser stems of the "Little Tuffy" sprinkler heads, the runtime for RCV #3 was changed from 12 minutes to 9 minutes and was to continue with that schedule until warmer weather arrived in order to determine how long the 25% decrease in runtime for RCV # 3 could remain without causing a noticeable stressing of the turf. The goal was to determine if the higher uniformity of the water application created by the "Little Valve" compensates for the lesser runtime. RCV #4 was unchanged with the original 12-minute runtime. Over a six-week period no visual sign of stress was observed nor was the viability of the turf jeopardized. The collected data indicates that a 25% reduction in watering time achieved an appreciable water savings of 58.9% during the six-week observation period without any noticeable negative affects on the turf.

Schedule #2

Valve	date	# of days irrigated	runtime	aver. water usage/day	% of water saved/day	gal/min
#4	3/21-5/2	14	12 min	619 gal		51.6 gal
#3	3/21-5/2	14	09 min	255 gal		25.0 gal
Difference ----------				**364 gal**	**58.9%**	**26.6 gal**

Warmer weather came on in the last week of April with temperatures well into the 90's. The turf irrigated by RCV #3 started to exhibit signs of stress when compared to the turf irrigated by RCV #4.

On Friday, May 3, 2008, the runtime for RCV #3 was increased to 16 minutes while the runtime for RCV #4 remained at 12 minutes. Both RCV #3 & #4 were reprogrammed to irrigate for three straight days in order to revive the turf irrigated by RCV #3 and restart the comparison between the two turf areas. The collected data indicates that RCV #3 still used 21.7% less water than RCV #4 yet had a 33.3 % longer runtime.

Schedule #3

Valve	date	# of days irrigated	runtime	aver. water usage/day	% of water saved/day	gal/min
#4	5/3-6	03	12 min	609 gal		50.7 gal
#3	5/3-6	03	16 min	477 gal		29.8 gal
Difference ----------				**132 gal**	**21.7%**	**20.9 gal**

UPDATE –June 15, 2008

On Thursday, May 8, 2008, both RCV #3 & #4 had their irrigation frequencies reprogrammed so that each valve waters four days per week with runtimes programmed to 12 minutes each.

Schedule #4

Valve	date	# of days irrigated	runtime	aver. water usage/day	% of water saved/day	gal/min
#4	5/8-19	08	12 min	666 gal		55.5 gal
#3	5/8-19	08	12 min	369 gal		30.7 gal
Difference ----------				**297 gal**	**44.5%**	**24.8 gal**

NOTE:
During this observation period the temperatures experienced in the City of Agoura Hills exceeded 100° F and broke historical records for the weekend of May 17-18, 2008.

Commencing Tuesday, May 20, 2008, both RCV #3 & #4 had their irrigation frequencies increased from four (4) days per week to five days per week and their runtimes programmed to 12 minutes.

Schedule #5

Valve	date	# of days irrigated	runtime	aver. water usage/day	% of water saved/day	gal/min
#4	5/20-6/2	10	12 min	632.3 gal		52.7 gal
#3	5/20-6/2	10	12 min	344.8 gal		28.7 gal
Difference ----------				**287.5 gal**	**45.4%**	**24.0 gal**

Beginning Wednesday, June 4, 2008, the runtime on RCV #3 was reduced by two minutes in order to take into consideration the higher uniformity achievable with the LittleValve and yet establish a sufficient runtime to insure that an adequate amount of water is applied to allow healthy turf development and growth as the seasonal temperatures increase. The irrigation frequency remained at five (5) days per week.

Schedule #6

Valve	**date**	**# of days irrigated**	**runtime**	**aver. water usage/day**	**% of water saved/day**	**gal/min**
#4	6/4-14	08	12 min	594.7 gal		49.5 gal
#3	6/4-14	08	10 min	273.5 gal		27.3 gal
Difference ----------				**321.2 gal**	**54.0%**	**22.2 gal**

UPDATE – September 2, 2008

Based on the above information, the City of Agoura Hills initiated a change-out on 1346 sprinkler heads in the City of Agoura Hills landscape medians as well as the sprinklers at City Hall.

The change-out commenced on August 1st on the Kanan Road medians and included the remaining three valves in the median on Thousand Oaks Blvd, east of Kanan Road. This particular controller and master valve monitors the irrigation water to 16 RCV valves primarily on Kanan Road from north of Thousand Oaks Blvd, southward to the 101 Freeway. The change-out also included all city-maintained street medians on Thousand Oaks Blvd westerly to the city limits abutting the City of Westlake Village. The median strip change-outs were completed on August 16th.

For the water usage for all water distributed by the Kanan Road master valve and controller, the adjusted figures (adjusted as if there had been no change-out on Station No. 3) are:

May = **102,856 gallons**
June = **116,167 gallons**
July = **137,065 gallons**

For the same area, the adjusted figure for the water usage for the month of August (adjusted to discount the water used during the change-out process for flushing and adjusting the sprinklers after replacement of parts and nozzles and after making necessary repairs) is: August = **57,415 gallons**.

From July to August, this represents a savings of **79,650 gallons.** Considering that the temperatures of August are comparable to July, the month to month percentage of water savings in August after LittleValve change-out = **58.1 %.** Note that the amount of water used in August is 44.2% less than what was used in May.

It is also noted that the combined water usage for July-August, 2007, was 299,948 gallons. Assuming August represents ½ of that (149,974 gals,) August of 2008 used approximately just 38.3% of what was used in August 2007. That represents year-over-year water savings in August, 2008 of **92,534 gallons, which equals 61.7% savings.**

UPDATE – October 4, 2008

Temperatures in September were so hot that starting with the second weekend of the month, Mr. Gonzalez felt it necessary to start watering 7 days weekly. On the last weekend of the month, as nights got cooler, he ceased watering on Saturday leaving 6 days weekly of watering. It is believed that September was a hotter month than July or August.

In order to keep the water days constant for comparison purposes, the September figures were adjusted in order to remove any extemporaneous watering such as weekend watering days.

Further, the controller was programmed so that watering times were now being dictated by daily ET input. Pre-set times are no longer a factor.

The adjusted water usage for all 16 valves for the month of September amounted to **64,250 gallons.** This represents a slight increase from the water used during August. Still, the usage compared to July shows a decrease of **53.1%.** Note that the amount of water used in September is 37.6% less than what was used in May.

Mr. Gonzalez has noted that other city employees have reported to him a major reduction of water onto the streets adjacent to the median strips after watering periods.

UPDATE – October 31, 2008 ---- The warmest October in Southern California since 1965. Watering still at 6 days weekly through the whole month.

The water used from October 1 to October 31 was **82,010** gallons. This means October's water usage resulted in savings of **40.2%** of the water used in July, the last month prior to change-out to LittleValves. **It is worth noting that during October, watering was taking place 6 days weekly, whereas in July, watering occurred only 5 days weekly.**

The water usage for October of 2007 was 150,348 gallons. 2008's usage of **82,010** represents year over year water savings of **45.5%** yet there was only **4 days** of watering each week in October of 2007 as opposed to 2008 when watering was taking place 6 days each week. By adjusting the October 2008 usage figure down to 4 days weekly – in order to correspond to 2007's watering days - the 82,010 gallons is adjusted lower by 1/3. This adjustment results in October's 2008 usage being **54,700** gallons, which represents a projected year-over-year savings of **63.6%** had the watering days been the same for the two October periods.

UPDATE – December 30, 2008 November was unseasonably warm whereas there was rain around Christmas time.

On November 21st, watering was reduced from 6 days weekly down to 3 days weekly. Based on the meter reads conducted by the Las Virgines Municipal Water District (LVMWD), the daily water usage for the period of October 31st to December 30th amounted to 1.750 HCF or 1,309 gallons. The daily usage for the corresponding period in 2007 amounted to 3.035 HCF or 2,270 gallons. This means the period's 2008 usage was **42.3% less than last year's**. The figures represent a daily water usage reduction of 961 gallons or year-over-year of approximately **28,830 gallons saved each month**.

This Report was prepared and reviewed with the concurrence and approval of Mr. Gonzalez.